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DIVISION OF THE
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M. M. LEIGHTON, *Chief*
URBANA

REPORT OF INVESTIGATIONS — No. 77

CHESTER OSTRACODES OF ILLINOIS

BY

CHALMER L. COOPER

PRINTED BY AUTHORITY OF THE STATE OF ILLINOIS

URBANA, ILLINOIS
1941

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Topographic Mapping in Cooperation with the United States Geological Survey.

This Report is a Contribution of the Division of Stratigraphy and Paleontology.

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CHESTER OSTRACODES OF ILLINOIS

BY

CHALMER L. COOPER

INTRODUCTION

THE FIRST DESCRIPTIONS of ostracodes apparently of Chester age were published during the last half of the nineteenth century by some of the early workers in Great Britain and were based on specimens collected from the Carboniferous "Limestone Series" of England[1]. The first American species were described by Ulrich in 1890 from beds in Kentucky and Illinois, but these fossils seem to have aroused little interest among paleontologists until after the first quarter of this century. The study of well cuttings by geologists connected with the petroleum industry and the recognition of the value of micro-fossils as horizon markers has resulted in a revival of interest in Carboniferous ostracodes, and since 1927 the number of published studies has steadily increased. The discovery of oil in the Chester series of the Illinois basin has recently directed attention to these ostracodes, and several papers have been published by Croneis, Coryell, their students, and others.

During this time several studies on other Chester formations appeared, chief among which were those of Coryell and Sohn (1938) on the Reynolds (Mauch Chunk) of West Virginia, Morey (1935) on the Amsden of Wyoming, Harlton (1929) on the Fayetteville of Oklahoma and Arkansas, and Roundy (1926) on the Barnett and Chappel of Texas. The Fayetteville fauna described by Girty (1910) should also be mentioned although it was not illustrated, since two important Carboniferous ostracode genera were first described therein, one of which, *Amphissites,* was subsequently figured by Roundy.

[1]For a complete bibliography of Chester ostracodes up to 1934 see Bassler, R. S., and Kellett, Betty, Bibliographic Index of Paleozoic Ostracoda: Geol. Soc. Am., Spec. Paper 1, 1934. Subsequent references will be found in the various synonomies and in the list of references at the end of this report.

The present study was undertaken to determine the stratigraphic ranges of all Chester ostracode species known in Illinois. It is based principally upon new collections obtained from outcrops, but is supplemented by samples from the cores and cuttings from a few wells. Many of the faunas are surprisingly rich, and fully one-third of the species recognized here are new. Although it is the first complete record of the distribution of Chester species, in so far as they are now known, this study must be regarded as a report of progress, because many more new species will probably be recognized upon the study of additional collections.

The accompanying faunal chart lists 359 species of Chester ostracodes, only 35 of which are not known to occur in Illinois. The determined stratigraphic ranges of species described from other areas, but also occurring in Illinois, permits the more precise correlation of widely separated Chester formations with the standard section than was formerly possible. Few species are identified with European forms, and these with some hesitation and only after careful study.

RANGE OF CHESTER OSTRACODES

CHESTER STRATIGRAPHY

The Chester series[2] in the Illinois basin, cropping out in southern Illinois and adjacent parts of Indiana and Kentucky, consists of eight limestone and shale formations alternating with a like number of sandstone or sandy shale formations. The limestone and shale formations vary considerably in both lithology and thickness. The sandstones are largely nonmarine although some

[2]For a recent, more complete discussion of the details of Chester formations see Weller and Sutton (1940, pp. 819-853), and Weller (1940, pp. 31-35).

contain marine fossils at a few localities. They also are quite variable in character and usually can be identified only by their association with the adjacent limestone-shale formations.

With the exception of the Aux Vases, all New Design and Homberg formations thin to the west, the Bethel being represented by a cherty horizon in outcrops near Mississippi River. There the Renault and Paint Creek are clastic littoral deposits, but contain considerable limestone to the east beyond the limits of the Aux Vases. Neither the Cypress nor the Hardinsburg is well developed in the west, the latter being present as a cherty zone in the Okaw formation.

The upper Chester, the Elvira group, seems in general more uniform than the lower groups, although the Vienna, Waltersburg, and Palestine thin both east and west from a central area in Johnson and Pope counties. The Degonia thins to the east, seemingly to compensate for the thickening of the Clore in this direction. The behavior of the Kinkaid is not very well known, as its thickness is quite variable due to pre-Pennsylvanian erosion. The other formations of the Elvira thin to the west. Many of the Chester sands thin and disappear, and the limestone-shale formations thin and become more dominantly shale to the southeast in west-central Kentucky, where the entire Elvira grades into a single shale unit, the Leitchfield formation. To the north in Indiana, however, the Chester sandstones are all present, though thinner and more shaly than in the central part of the basin.

Ostracodes are abundant in some calcareous shale beds of all of the Chester limestone-shale formations. The number of species recognized in each formation is roughly proportional to the number of collections studied. Although the greatest number of species, 94, is recorded from the Golconda (7 collections) and the smallest number, 40, from the Glen Dean (2 collections), it is believed that continued study will maintain about the same proportion of species shown in the check list on page 8.

Like the larger invertebrate fossils a greater number of diagnostic species occur in the lower than in the higher formations. In the New Design group 50 per cent of the species are, so far as now known, restricted to one formation, whereas in the Homberg and Elvira groups only 39 and 30 per cent respectively are so restricted.

The greatest change in ostracode faunas appears to occur at the Homberg-Elvira boundary. Only seven species are known to be present in both the Glen Dean and Vienna formations, although 21 of the 40 Glen Dean species occur in the Golconda, and of the 48 Vienna species 32 occur in the Menard. This relationship may be somewhat exaggerated because of the relatively small number of Glen Dean and Vienna species that have been recognized, but it seems unlikely that additional material would entirely eliminate this discrepancy. In contrast the New Design - Homberg boundary is not so clearly marked by change in the ostracode faunas. Eighteen species are common to the Paint Creek and Golconda, whereas 15 of the 61 Paint Creek species occur in the Renault and 20 of the 94 Golconda species are represented in the Glen Dean. The following table shows similar relationships for all of the Chester formations.

Sixty-seven genera of ostracodes have been recognized in this study. Of this number 27 are, as far as known, restricted to the Mississippian system, 11 range from the Devonian to the Pennsylvanian, seven occur in both the Devonian and Mississippian, and 22 are present in both the Mississippian and Pennsylvanian. Genera alone are of little or no stratigraphic significance. Only eight genera are known from but a single formation and all of these are rare forms, five of them being known from only one species each. Additional collections will undoubtedly extend most of their ranges.

Over half of the known Chester species, however, appear to be restricted to a single formation. This does not mean, however, that these are all good index fossils. The distinguishing characteristics of the species in several genera are so slightly different that, even though usually found in great abundance, they are easily confused and therefore are of little value for correlation. Falling within this category are *Bairdia, Cavellina, Healdia,* and a number of the species of the old Amphissitinae, many of which are included in the new genera *Ectodemites* and *Polytylites.*

DISTRIBUTION

New Design Group

The following nine genera have been found only in the Renault and Paint Creek formations: *Cribroconcha, Hastacypris, Incisurella, Tetratylus, Sulcella, Chesterella, Oliganisus, Cyathus,* and *Coryellina.* Four of them, *Cribroconcha, Sulcella, Cyathus,* and *Coryellina,* are present in the Pennsylvanian, however, and therefore are not restricted to the New Design group, and *Oliganisus* is found in the middle Mississippian. The four remaining genera are now known only from the lowest Chester group.

The following species have been found only in the Renault and Paint Creek formations: *Cribroconcha costata* n. sp., *Incisurella lata* n. sp., *Glyptopleura bristoli* Croneis and Gutke, *Discoidella pendens* Croneis and Gutke, *Oliganisus geisi* Croneis and Gutke, and *Moorites elongatus* n. sp. Of these *I. lata* and *M. elongatus* seem to be good markers for this group, especially the latter, which is quite distinctive. The only other Chester species of *Moorites* known is from the Vienna.

Renault formation.—Of the 31 restricted Renault species, 16 are new. Many of these, together with some of those described by Croneis and Gutke (1939), are too imperfectly known to serve as good index forms. Few *Bairdia* are good horizon markers but *B. aequa* n. sp. seems to possess, in its very flat parallel sides, sufficient differentiation to make it fairy easy to recognize. In the Gyptopleuridae, *Glyptopleura henbesti* Croneis and Gutke, *Glyptopleurina longuronis* n. sp., *Glyptopleuroides girtyi* and *G. perplexus* Croneis and Gutke are distinctive. *Hollinella longispina* (Jones and Kirkby), from the Carboniferous limestone of England and Scotland, seems to be confined to the Renault in Illinois. The genus *Chesterella* Croneis and Gutke, represented by *C. exuta* and *C. fissurata,* and *C.? incerta*

Correlation of Chester Formations[a]

Group	Standard Section	Southwestern Illinois	Southeastern Illinois and Western Kentucky	Southwestern Indiana	West-Central Kentucky
Elvira	Kinkaid fm.	Kinkaid fm.	Kinkaid ls. & sh.	Negli Creek ls.	Leitchfield fm.
	Degonia ss.	Degonia ss.	Degonia ss.	Mt. Pleasant ss.	
	Clore fm.	Clore fm.	Clore sh. & ls.	Gennet Creek sh.	
	Palestine ss.	Palestine ss.	Palestine ss.	Bristow ss.	
	Menard fm.	Menard fm.	Menard ls. & sh.	Siberia ls.	
	Waltersburg ss.	Baldwin fm.	Waltersburg ss.	Wickcliffe ss.	
	Vienna fm.		Vienna ls. & sh.	Unnamed sh.	
	Tar Springs ss.		Tar Springs ss.	Tar Springs ss.	
Homberg	Glen Dean fm.	Okaw ls.	Glen Dean sh. & ls.	Glen Dean ls.	Glen Dean ls.
	Hardinsburg ss.		Hardinsburg ss.	Hardinsburg ss.	Hardinsburg ss.
	Golconda fm.		Golconda sh. & ls.	Golconda ls.	Golconda ls.
				Indian Creek sh.	
	Cypress ss.	Ruma fm.	Cypress ss.	Cypress ss.	Cypress ss.
New Design	Paint Creek fm.	Paint Creek fm.	Paint Creek sh. & ls.	Beech Creek ls.	Girkin ls.
				Elwren ss. & sh.	
				Reelsville ls.	
	Bethel ss.	Yankeetown cht.	Bethel ss.	Sample ss. & sh.	
	Renault fm.	Renault fm.	Renault ls. & sh.	Beaver Bend ls.	
				Mooretown sh. & ss.	
				Paoli ls.	
	Aux Vases ss.	Aux Vases ss.			

a In part after Weller and Sutton, p. 766, 1940.

n. sp., is one of the few Chester genera restricted to a single formation. Insofar as now known, none of these species are found outside the Renault. The following list contains those species found only in the Renault.

Species Restricted to the Renault Formation

Monoceratina opima n. sp.
*Bairdia aequa n. sp.
Bairdia impendere n. sp.
Bairdia insolens n. sp.
Bairdiolites tenuis n. sp.
Bythocypris gibba n. sp.
*Bythocypris truncata n. sp.
Hastacypris bradyi Croneis and Gutke
Incisurella prima n. sp.
Macrocypris biconcava Croneis and Gutke
Microcheilinella? exilis n. sp.
Seminolites ovalis n. sp.
Glyptopleura elliptica Croneis and Gutke
*Glyptopleura henbesti Croneis and Gutke
*Glyptopleurina longuronis n. sp.
Glyptopleurina simulans Croneis and Gutke
*Glyptopleuroides girtyi Croneis and Gutke
*Glyptopleuroides perplexus Croneis and Gutke.
*Hollinella longispina (Jones and Kirkby)
Discoidella ampla n. sp.
Polytylites ambitus n. sp.
Polytylites grovei (Croneis and Gutke)
*Chesterella exuta Croneis and Gutke
*Chesterella fissurata Croneis and Gutke
*Chesterella? incerta n. sp.
Knoxina rogatzi Croneis and Gutke
Neokloedenella subquadrata Croneis and Gutke
Sansabella vinitaensis (Harlton)
Proparaparchites fabulus n. sp.
Coryellina elegans (Croneis and Gutke)
Moorites intermedius n. sp.

Paint Creek formation.—Although all restricted Paint Creek species are new, several of the 31 should make good horizon markers. *Cribroconcha fornicata,* possessing characteristics of both *Healdia* and *Seminolites,* is a distinctive form not found in any other

*Species of probable correlative value.

Check List of Chester Ostracode Species[a]

	Illinois Chester Formations[a]								Other Chester Formations[b]						
	Elvira				Homberg		New Design								
	Kinkaid	Clore	Menard	Vienna	Glen Dean	Golconda	Paint Creek	Renault	Barnett, Texas	Batesville, Ark.	Fayetteville, Ark.	Fayetteville, Okla.	Reynolds, W. Va.	Amsden, Wyo.	Carboniferous, Great Britain
Total species	81	74	74	48	40	94	61	67	7	4	32	19	25	17	10
Kinkaid	**51** 63	28 70	26 47	18 45	7 24	9 16	7 23	8 22	0	2	10	2	6	4	2
Clore	28 55	**40** 54	20 36	15 38	5 17	9 16	4 13	4 11	1	1	7	5	8	6	1
Menard	26 51	20 50	**55** 74	32 80	13 45	18 32	8 27	8 22	0	0	8	3	12	2	2
Vienna	18 35	15 38	32 58	**40** 83	7 24	17 30	7 23	10 28	0	0	7	1	7	1	2
Glen Dean	7 14	5 13	13 24	7 18	**29** 73	21 37	3 10	9 25	0	1	6	4	5	3	3
Golconda	9 18	9 23	18 33	17 43	20 69	**57** 61	18 60	20 55	1	1	9	4	5	1	2
Paint Creek	7 14	4 10	8 14	7 18	3 10	18 32	**30** 49	15 42	0	0	5	2	4	0	0
Renault	8 16	4 10	8 14	10 25	9 31	20 35	15 50	**36** 54	0	1	7	3	2	1	0

a In the first eight vertical columns the upper number in black type at the intersection of the horizontal and vertical columns of any one formation represents the number of species in this formation which are found in other Illinois Chester formations (51 of the 81 Kinkaid species are found in other formations). The figures below the black face numbers show the per cent of the total species present in other formations. The upper figures at the intersection of other horizontal and vertical columns represent the number of species common to any two formations (e.g., 32 species are common to the Vienna and Menard formations). The lower figure in small type gives the percentage of the species common to any two formations (e.g., the 32 Menard species found in the Vienna represents 58 per cent of the 55 Menard species present in other formations; likewise the 32 Vienna species in the Menard represents 80 per cent of the 40 Vienna species present in other formations).

b In the last seven columns the figures show the number of species from other formations recognized in the Chester of Illinois.

formation. Two species of the new *Tetratylus, T. ellipticus* and *T. elongatus,* are also characteristic of the Paint Creek. The only other known species of this genus is found in the Menard. *Glyptopleurina flexuosa* is sufficiently well marked to be easily recognized. *Perprimitia elongata* is distinguished from species of *Perprimitia* present in other formations by its elongate thin carapace. *Moorea? circincta,* distinguished by its almost flat subparallel sides bordered by a ridge located well in from the margins, is probably the most distinctive Paint Creek form. *Moorites convexus* is distinguished from its long-range associates by its tumid ovate dorsal outline and lack of a prominent border around the free margins. The list of restricted Paint Creek species follows:

Species Restricted to the Paint Creek Formation

Acratia obtusa n. sp.
Bairdia curvis n. sp.
Bairdiolites vulgaris n. sp.
Bythocypris modicus n. sp.
Bythocypris ovatus n. sp.
*Cribroconcha fornicata n. sp.
Healdia menisca n. sp.
Healdia minuta n. sp.
Healdia radinula n. sp.
Seminolites symmetricus n. sp.
*Tetratylus ellipticus n. sp.
*Tetratylus elongatus n. sp.
*Beyrichia sagitta n. sp.
Paracavellina opima n. sp.
Paracavellina tumida n. sp.
Sulcella celsa n. sp.
Sulcella nodocosta n. sp.
Sulcella ovata n. sp.
*Glytopleurina flexuosa n. sp.
Ectodemites magnireticulatus n. sp.
Ectodemites quadratus n. sp.
Kirkbya elongata n. sp.
Kirkbyella truncata n. sp.
Jonesina equilatera n. sp.
*Perprimitia elongata n. sp.
Sansabella ampla n. sp.
Sansabella elongata n. sp.
Sansabella ovata n. sp.
Cyathus vetustus n. sp.
*Moorea? circincta n. sp.
*Moorites convexus n. sp

Homberg Group

Genera restricted to the Homberg group are as follows: *Golcondella, Geffenina, Kloedenella, Knightina,* and *Tetrasacculus. Kloedenella* heretofore has been known in North America only from the Silurian and Devonian, and *Tetrasacculus* from Middle Devonian strata of Ohio and Michigan. *Knightina* is a genus found previously in the Pennsylvanian and Permian of the mid-Continent region. *Golcondella* and *Geffenina* are not known outside of the Homberg group.

The following species are found in both the Golconda and Glen Dean formations but are restricted to the Homberg group. Those marked with an asterisk are sufficiently diverse to form good markers.

Glyptopleura intermedia Croneis and Gale
*Glyptopleurina? bulbosa Croneis and Gale
Glyptopleurina ornata (Croneis and Gale)
Glyptopleurina simplex Croneis and Bristol
*Glyptopleuroides insculptus Croneis and Gale
*Amphissites carinatus n. sp.
*Jonesina craterigera (Brady)
*Tetrasacculus mirablilis (Croneis and Gale)

Golconda formation.—Approximately half of the 36 restricted Golconda species are new, but some of these are sufficiently abundant and distinctive to make good horizon markers. *Monoceratina celsalobata* n. sp. is distinguished from other species of *Monoceratina* by its low thick form and the relatively high position of the spines as seen in lateral view. *Beyrichia contracta* n. sp. and *B. placida* Croneis and Gale are Golconda species, and the only other Chester representative of this genus is *B. sagitta* n. sp. from the Paint Creek. *Glyptopleura decacostata* Croneis and Gale may be recognized by the pronounced forward swing and the relatively wide area free of costae at the posterior end. *Denisonia brevicosta* n. sp. and *D. cirrata* n. sp. both possess shells with a pronounced swing, with unequal ends, and with a relatively short ridge in the middle of the shell. The single Menard species lacks the swing, has a long ridge, and has ends of equal height. Other species which seem distinctive are *Golcondella sulcata, Glyptopleura pentacostata, Glyptopleurina vetula,* and *Geffenina? praelonga.*

The complete list of restricted Golconda species follows:

Species Restricted to the Golconda Formation

*Monoceratina celsalobata n. sp.
Bairdia? osorioi Croneis and Gale
Bairdia cf. subelongata Jones and Kirkby
Bythocypris opima n. sp.
Healdia cornigera (Jones and Kirkby)
Healdia elliptica n. sp.
Healdia mucronata n. sp.
Healdia opima n. sp.
Seminolites? reversus n. sp.
*Beyrichia contracta n. sp.

*Species of probable correlative value.

*Beyrichia placida Croneis and Gale
Cavellina longula n. sp.
Paracavellina elliptica n. sp.
*Paracavellina pinguis n. sp.
Golcondella sulcata Croneis and Gale
Glyptopleura curvata Croneis and Gale
*Glyptopleura decacostata Croneis and Gale
*Glyptopleura pentacostata Croneis and Gale
Glyptopleurina insignis Croneis and Gale
*Glyptopleurina vetula n. sp.
Discoidella simplex Croneis and Gale
Kirkbya regularia Croneis and Gale
Kirkbya cf. reflexa Girty
Kirkbya turrita Croneis and Gale
Polytylites similis (Croneis and Gale)
Polytylites trilobus (Croneis and Gale)
*Denisonia brevicosta n. sp.
*Denisonia cirrata n. sp.
*Geffenina? praelonga n. sp.
Jonesina persulcata Croneis and Gale
Knightina neglecta Croneis and Gale
Knightina pinguoides Croneis and Gale
Neokloedenella? magna n. sp.
Perprimitia? bicornis Croneis and Gale
Sansabella declivis n. sp.
Sansabella truncata n. sp.

Glen Dean formation.—As in other formations, about half of the restricted species of the Glen Dean are of value as index fossils. Of the remainder, four are species described by Ulrich (1891) from Kentucky and Illinois and have not been recognized by subsequent workers. *Polytylites directus* n. sp. is easily recognized because of its unusually elongated vertical nodes. *Acratia mucronata* n. sp., *Bairdia attenuata* Girty, and *Kloedenella macer* n. sp. are also distinctive of the Glen Dean.

Species Restricted to the Glen Dean Formation

*Acratia mucronata n. sp.
*Bairdia attenuata Girty
Healdia caneyensis Harlton
*Polytylites directus n. sp.
Polytylites tricollinus (Jones and Kirkby)
*Kloedenella macer n. sp.
Primitia cestriensis Ulrich
Primitia granimarginata Ulrich
Primitia simulans Ulrich
Moorea granosa Ulrich

Elvira Group

Nine genera were found to occur exclusively in the upper Chester group, namely, *Beyrichiopsis, Platychilus, Sargentina, Venula, Balantoides, Gillina, Kloedenellina, Pseudoparaparchites,* and *Carboprimitia.* The first, *Beyrichiopsis,* is known in the Devonian, so it is presumed that species yet undescribed will be found in the older Chester groups. *Pseudoparaparchites* is represented in the Pennsylvanian and Permian, but is unknown below the Elvira. All other genera listed above are restricted to the group.

Many species of the Elvira are restricted to two adjacent formations, and in many cases will serve as good index forms when others are not available. These species are given in the following lists, those thought to be of greatest value being marked with an asterisk.

Kincaid-Clore Species

*Bairdia sinuosa n. sp.
Bairdiolites elongatus Croneis and Funkhouser
*Bythocypris clorensis Croneis and Funkhouser
Macrocypris reginni Coryell and Johnson
Glyptopleura alata Croneis and Funkhouser
Glyptopleura compta Croneis and Thurman
Glyptopleura symmetrica Croneis and Funkhouser
Glyptopleurina insculpta (Croneis and Funkhouser)
*Venula striata (Croneis and Funkhouser)
*Ectodemites tumidus n. sp.
*Ectodemites warei (Morey)
*Perprimitia funkhouseri Croneis and Thurman
Sansabella harrisi Croneis and Funkhouser

Clore-Menard Species

Healdia fayettevillensis Harlton
Kirkbya aequalis Croneis and Funkhouser
*Denisonia cincta Croneis and Bristol
Jonesina puncta Morey

Menard-Vienna Species

Healdia exilis n. sp.
Healdia goniapleura Croneis and Bristol
*Glyptopleurina oehersi (Croneis and Bristol)
Kirkbya fossula Croneis and Bristol

Vienna formation.—Only eight restricted species are found in the Vienna, six of which are new. Of the eight, four are recognized easily, namely, *Healdia vinitaensis* Harlton, *Platychilus ovoides* n. sp., *Glyptopleurina iniqua* n. sp., and *Sansabella parallela* n. sp. *Cavellina parva, Polytylites diversus,* and *Moorites brevis,* all new species, complete the Vienna list.

Menard formation.—At least five of the 19 restricted species in the Menard form good index fossils. *Bairdia brevis* Jones and Kirkby has an unusually high dorsum, a very long dorso-posterior slope, and a low, sharp posterior termination. *Bairdiolites fornica-*

*Species of probable correlative value.

tus n. sp. has a very highly arched dorsum, is comparatively short, and has a short but somewhat sharp posterior end. *Paracavellina ovata* n. sp. is the shortest species so far recognized in this genus. *G. kayi* Croneis and Bristol can be distinguished from other species of *Glyptopleura* by the ribs which are concave upward just below the pit. *Kirkbyella truncata* possesses a prominent vertical furrow across the posterior end.

Species Restricted to the Menard Formation

*Bairdia brevis Jones and Kirkby
Bairdia delicata Morey
*Bairdiolites fornicatus n. sp.
Macrocypris acuminata n. sp.
Macrocypris chapmani Croneis and Bristol
Cavellina dispar n. sp.
*Paracavellina ovata n. sp.
Glyptopleura carrolli Croneis and Bristol
*Glyptopleura kayi Croneis and Bristol
Glyptopleura resupinata Croneis and Bristol
Ectodemites monomastadis (Coryell and Sohn)
Ectodemites parvus n. sp.
*Kirbyella truncata n. sp.
Polytylites concavus (Croneis and Bristol)
Jonesina lalickeri Croneis and Bristol
Carboprimitia campa n. sp.

Clore formation.—The genus *Glyptopleura,* which reaches its maximum development in the upper Elvira, has eight species restricted to the Clore. The most distinctive of these is the rectangular *G. inoptina* Girty, first described from the Fayetteville shale of Arkansas. This species is readily differentiated by its characteristic lateral outline, large overlap, and by the median rib which, instead of ending at the pit, bends upward and around the pit, joining the rib next above it. Other particularly distinctive species are *G. multicostata* Morey, *G. sagae* Coryell and Johnson and *G. tyri* (Coryell and Johnson).

Other distinctive forms not known outside of the Clore are *Beyrichiopsis brynhildae, B. thori, Sargentina allani* and *Lochriella fenriri,* all described by Coryell and Johnson. *Polytylites reticulatus* n. sp. may be recognized by the high position of the inner carina. The Clore also has a large number of Amphissitinae, which however, are difficult to distinguish specifically and therefore are not good index fossils.

*Species of probable correlative value.

Species Restricted to the Clore Formation

Bairdiolites ovatus Croneis and Funkhouser
Bythocypris amsdenensis Morey
*Beyrichiopsis brynhildae Coryell and Johnson
*Beyrichiopsis thori Coryell and Johnson
Cavellina congruens n. sp.
Cavellina hoeniri Coryell and Johnson
Cavellina ithunnae Coryell and Johnson
Cavellina librata n. sp.
*Sargentina allani Coryell and Johnson
Glyptopleura alata Croneis and Funkhouser
Glyptopleura elongata n. sp.
Glyptopleura friggae Coryell and Johnson
*Glyptopleura inoptina Girty
*Glyptopleura multicostata Morey
*Glyptopleura sagae Coryell and Johnson
Glyptopleura similis Croneis and Funkhouser
*Glyptopleura tyri (Coryell and Johnson)
Balantoides moreyi Croneis and Funkhouser
Kirkbya marginata Croneis and Funkhouser
*Polytylites reticulatus n. sp.
Gillina vitharri Coryell and Johnson
Jonesina odini Coryell and Johnson
Jonesina spinosa Croneis and Funkhouser
Kloedenellina heimdalli Coryell and Johnson
Lochriella fenriri (Coryell and Johnson)
Lochriella reversa (Morey)
Perprimitia sigynae (Coryell and Johnson)
Sansabella lenticularis n. sp.
Sansabella njorthi (Coryell and Johnson)
Paraparchites ovatus n. sp.
Carboprimitia longula n. sp.
Primitia cestriensis caldwellensis Ulrich
Primitia subaequata Ulrich

Kinkaid formation.—The Kinkaid, like the Clore, contains numerous species of the Amphissitinae and *Glyptopleura.* The former contains the species *Amphissites exiguus* n. sp., *A. rugosus* Girty, and *Ectodemites primus* n. sp., which have the variant characteristics necessary to form good horizon markers. Six species of *Glyptopleura* are restricted to the Kinkaid, *G. alvea* n. sp. being the most easily recognized by reason of its flattened dorsum and the few thin costae. Other restricted species, all new, include the large thick *Acratia tumida,* the long slender *Bairdia aculeata,* and *Sargentina asulcata. Kirkbya bifrons* and *Deloia serrata,* described by Croneis and Thurman, are also thought to be good horizon markers.

*Species of probable correlative value.

Species Restricted to the Kinkaid Formation

Acratia tumida n. sp.
Bairdia aculeata n. sp.
Bairdia subtila n. sp.
Bairdiolites procerus n. sp.
Macrocypris ovata n. sp.
Microcheilinella cordata n. sp.
*Sargentina asulcata n. sp.
Sargentina crassimarginata (Croneis and Thurman)
Glyptopleura adunca Croneis and Thurman
*Glyptopleura alvea n. sp.
Glyptopleura circumcostata n. sp.
Glyptopleura reniformis Croneis and Thurman
Glyptopleura teretiformis Croneis and Thurman
*Amphissites exiguus n. sp.
Amphissites quadratus n. sp.
*Amphissites rugosus Girty
Balantoides reticulatus Croneis and Thurman
Ectodemites elongatus n. sp.
*Ectodemites primus n. sp.
*Kirkbya bifrons Croneis and Thurman
Kirkbya humerosa n. sp.
Kirkbya intermedia Croneis and Thurman
Polytylites crassus n. sp.
Polytylites sublineatus (Croneis and Thurman)
*Deloia serrata Croneis and Thurman
Deloia tumida n. sp.
Proparaparchites ovatus n. sp.
Pseudoparaparchites? aclis Croneis and Thurman

CHESTER CORRELATIONS

Ostracodes have been described from three Upper Mississippian formations which crop out in areas outside of the Illinois basin. These are the Amsden formation of Wyoming, the Reynolds formation of West Virginia, and the Fayetteville shale of western Arkansas and eastern Oklahoma. These formations all appear, from the data now available, to correlate with the upper Chester Elvira group, although the Fayetteville contains several species found in the middle and lower groups. In addition to these formations, a few scattered species have been reported from the Bell shale of Ontario, the Batesville sandstone of Arkansas, and the Barnett shale of Texas.

Amsden formation.— Darton (1904) named the Tensleep and Amsden formations, which occur between the Chugwater and Madison and are exposed along a branch of Tongue River west of Dayton, Wyoming, and considered them to be of Pennsylvanian age. Branson and Greger (1918) established the Mississippian age of the Amsden in the Wind River Mountains, correlating it with the Ste. Genevieve formation of the Mississippi Valley. Morey (1935) described 17 species of ostracodes from the Amsden, and followed Branson and Greger's correlation. He stated however "that comparatively little on ostracode faunas of this period has been published and, therefore, it is not easy to make exact correlations." Scott (1935), in connection with a discussion of the Big Snowy group of Montana which immediately underlies the Amsden, considered the Amsden fauna "to be more closely related to the Chester fauna than any other. . . . When this fauna is considered in relation to that of the underlying Big Snowy group, and when stratigraphic relationships are taken into consideration, the Amsden of central Montana must be middle or upper Chester in age."

A preponderance of the Amsden ostracode species is found in the upper Chester Clore formation. Of the restricted forms, five Amsden species occur in the Elvira, one in the Homberg and none in the New Design. Although the Amsden fauna is small, the presence of such species in the Clore as *Bythocypris amsdenensis, Glyptopleura multicostata,* and *Ectodemites warei* appears to be particularly significant.

Reynolds limestone.—The Reynolds, defined as a member of the Bluefield formation of the Mauch Chunk "group" by Reger (1926), crops out in Monroe County, southeastern West Virginia. It, with the overlying Ada and Talcott members, was considered to be the equivalent of the Clore formation. Coryell and Sohn (1938) described 13 ostracode species from a shale bed near the top of the formation exposed in a quarry near Morgantown, some distance from the type locality. They attempted no correlation other than that shown on a columnar section which gives the members of the Bluefield and Greenbrier groups. The only tie with the Illinois formations given in the section is the Bethel sandstone which is shown between Fredonia below and Gasper above, and is erroneously correlated with the "Meramecan."

An examination of topotype material has more than doubled the number of species, bringing the total number of known species (exclusive of those as yet undescribed)

*Species of probable correlative value.

to 27. While the Reynolds fauna is small, those species found in it are quite distinctive. The present study shows a decided prevalence of Elvira species, all but one of the restricted species occurring in this group. Within the group there is a dominance of Menard forms. The overlying Talcott and Ada members are probably also referable to the Menard, and the Droop may be equivalent to the Palestine as they correspond lithologically more closely than do the shaly Webster Springs and Bickett members.

The upper Chester age of the Reynolds is shown by the presence of *Ectodemites monomastadis, Deloia serrata* and large numbers of *Carboprimitia,* among which is found *C. depressa* Croneis and Funkhouser. The correlation of the Reynolds with the Menard, which is high in the type Chester series, raises an interesting speculation as to the West Virginia equivalents of the Clore and Kinkaid, and as to the probable age of the many hundreds of feet of Mauch Chunk beds which must lie above the equivalent of the highest Chester formation of the Illinois basin.

Fayetteville shale.—Simonds (1891) described this formation from outcrops in northwestern Arkansas, but confused it with the Moorefield. Adams and Ulrich (1904) gave the correct position of the formation in the succession and later (1905) the same authors placed the Wedington sandstone in the upper Fayetteville as a member of that formation. Croneis (1930, p. 69), after an exhaustive faunal study, concluded that "although these Arkansan beds may be correlated with parts of the Chester series of Illinois, they are more closely related to such southern formations as the Caney shale of Oklahoma and the upper Gasper, Golconda and Bangor formations of Alabama".

David White (1937), from a study of the fossil plants, determined the age of the Wedington sandstone as upper Chester. Girty (1910) described, but did not figure, 13 new species of ostracodes from the Fayetteville of Arkansas. Later, Harlton (1929) described 12 species, most of which were new, from the formation in Arkansas and Oklahoma. However, neither Girty nor Harlton attempted correlations with type Chester formations. Half of their species have not been recognized in the Illinois Chester, largely because of the lack of illustrations in the former paper. However, an examination of some of Girty's types has overcome a part of this difficulty. Our collections contain about 50 species from Oklahoma and Arkansas and, eliminating new species and duplicates, there remain about 30 species on which correlations can be based.

There appears to be close agreement in the distribution of the Oklahoma and Arkansas species with respect to the type Chester, each showing two distinct affinities, one with the middle Chester (Golconda) and the other with the upper Chester (Clore and Kinkaid). The restricted Chester species show that the affinity of the Fayetteville is much closer with the upper Chester than with the Golconda. This correlation is in close agreement with the conclusions of Croneis based on the megafauna, because the Bangor limestone occurs below the Pennington shale. The latter, according to Reger (1926, pp. 311-312) is equivalent to the Hinton and succeeding groups, which may be younger than any formations in the type Chester section. Thus the Bangor of Alabama and Tennessee, the Fayetteville of northeastern Oklahoma and Arkansas, and equivalent portions of the Caney shale of Oklahoma appear to correspond to the Elvira group of Illinois.

The Elvira species occurring in the Fayetteville are as follows, the particularly significant ones being starred.

Bairdia aculeata n. sp.
Bythocypris clorensis Croneis and Funkhouser
Healdia fayettevillensis Harlton
Healdia vinitaensis Harlton
*Glyptopleura inoptina Girty
Glyptopleura multicostata Morey
*Amphissites rugosus Girty
*Denisonia cincta Croneis and Bristol
Lochriella reversa (Morey)
Sansabella harrisi Croneis and Funkhouser

The most characteristic Fayetteville species, *Graphiadactyllis arkansana* (Girty), which outnumbers all others in most of the Oklahoma and Arkansas collections, is not represented by a single specimen in the Chester collection of Illinois and adjacent states that have been studied. Other species of *Graphiadactyllis* are known from the lower Mississippian (Kinderhook) of southern Illinois but these are easily differentiated from the Fayetteville species.

Faunal Chart

Species	Renault	Paint Creek	Golconda	Glen Dean	Vienna	Menard	Clore	Kinkaid	Others[a]
ACRONOTELLIDAE									
Monoceratina celsalobata Cooper	—	—	x	—	—	—	—	—	—
Monoceratina furcula Croneis and Gale	—	—	x	—	—	x	x	—	6
Monoceratina opima Cooper	x	—	—	—	—	—	—	—	—
Triceratina inconsueta (Croneis and Gutke)	x	—	—	—	—	x	—	—	—
BAIRDIIDAE									
Acratia disjuncta Morey	—	—	—	—	—	—	—	—	7
Acratia mucronata Cooper	—	—	—	x	—	—	—	—	6
Acratia obtusa Cooper	—	x	—	—	—	—	—	—	—
Acratia tumida Cooper	—	—	—	—	—	—	—	x	—
Bairdia aculeata Cooper	—	—	—	—	—	—	—	x	3
Bairdia aequa Cooper	x	—	—	—	—	—	—	—	—
Bairdia attenuata Girty	—	—	—	x	—	—	—	—	4
Bairdia brevis Jones and Kirkby	—	—	—	—	—	x	—	—	—
Bairdia cestriensis Ulrich	x	—	x	x	—	x	—	—	3,4
Bairdia contracta Morey	—	—	—	—	—	—	—	—	7
Bairdia curvis Cooper	—	x	—	—	—	—	—	—	—
Bairdia delicata Morey	—	—	—	—	—	x	—	—	7
Bairdia galei Croneis and Thurman	—	—	—	—	cf.	—	—	x	—
Bairdia golcondensis Croneis and Gale	x	—	x	x	—	—	—	x	3
Bairdia granireticulata Harlton	—	x	x	—	—	—	—	—	3, 4
Bairdia impendere Cooper	x	—	—	—	—	—	—	—	—
Bairdia insolens Cooper	x	—	—	—	—	—	—	—	—
Bairdia lanulata Harlton	—	—	—	—	—	—	—	—	4
Bairdia mccoyi Croneis and Gutke	x	—	x	x	—	—	—	—	—
Bairdia nasuta Morey	—	—	—	—	—	—	—	—	7
Bairdia? osorioi Croneis and Gale	—	—	x	—	—	—	—	—	—
Bairdia renaultensis Croneis and Gutke	x	—	cf.	—	—	—	—	—	—
Bairdia sinuosa Cooper	—	—	—	—	—	—	x	x	—
Bairdia subelongata Jones and Kirkby	—	—	cf.	—	—	—	—	—	8
Bairdia subtila Cooper	—	—	—	—	—	—	—	x	—
Bairdia submucronata (Jones and Kirkby)	—	—	—	—	—	—	—	—	3, 8
Bairdia? subrotundata Harlton	—	—	—	—	—	—	—	—	3
Bairdiolites brevirostris Croneis and Thurman	—	—	—	—	—	x	—	x	—
Bairdiolites bulbosus Croneis and Bristol	—	—	x	x	x	x	x	—	—
Bairdiolites crassus Cooper	—	—	—	—	—	—	x	—	—
Bairdiolites crescentis Croneis and Gale	—	—	x	—	x	x	cf.	x	—
Bairdiolites elongatus Croneis and Funkhouser	—	—	—	—	—	—	x	x	—
Bairdiolites fornicatus Cooper	—	—	—	—	—	x	—	—	—
Bairdiolites ovatus Croneis and Funkhouser	—	—	—	—	—	—	x	x	—
Bairdiolites platypleurus Croneis and Gale	x	—	x	cf.	—	—	—	—	—
Bairdiolites procerus Cooper	—	—	—	—	—	—	—	x	—
Bairdiolites tenuis Cooper	x	—	—	—	—	—	—	—	4
Bairdiolites vulgaris Cooper	—	x	—	—	—	—	—	—	—
Beyrichiopsis brynhildae Coryell and Johnson	—	—	—	—	—	—	x	—	—
Beyrichiopsis thori Coryell and Johnson	—	—	—	—	—	—	x	—	—
Bythocypris amsdenensis Morey	—	—	—	—	—	—	x	—	4, 7
Bythocypris clorensis Croneis and Funkhouser	—	—	—	—	—	—	x	x	3
Bythocypris concava Cooper	—	—	—	—	x	x	—	x	—
Bythocypris fabalis Cooper	—	x	x	—	—	—	—	—	—
Bythocypris fayettevillensis Harlton	—	—	—	—	—	—	—	—	4
Bythocypris gibba Cooper	x	—	—	—	—	—	—	—	—
Bythocypris modica Cooper	—	x	—	—	—	—	—	—	—

Species	Renault	Paint Creek	Golconda	Glen Dean	Vienna	Menard	Clore	Kinkaid	Others[a]
Bythocypris opima Cooper	—	—	x	—	—	—	—	—	—
Bythocypris ovata Cooper	—	x	—	—	—	—	—	—	—
Bythocypris truncata Cooper	x	—	—	—	—	—	—	—	—
Cribroconcha conspicua (Harlton)	—	—	—	—	—	—	—	—	3
Cribroconcha costata Cooper	x	x	—	—	—	—	—	—	—
Cribroconcha fornicata Cooper	—	x	—	—	—	—	—	—	—
Hastacypris bradyi Croneis and Gutke	x	—	—	—	—	—	—	—	—
Healdia aequabilis Cooper	x	x	x	—	—	—	—	—	—
Healdia bluefieldiana Coryell and Sohn	—	—	—	—	—	—	—	—	6
Healdia caneyensis Harlton	—	—	—	x	—	—	—	—	—
Healdia cornigera (Jones and Kirkby)	—	—	x	—	—	—	—	—	8
Healdia elliptica Cooper	—	—	x	—	—	—	—	—	—
Healdia exilis Cooper	—	—	—	—	x	x	—	—	6
Healdia fayettevillensis Harlton	—	—	—	—	—	x	x	—	3
Healdia goniapleura Croneis and Bristol	—	—	—	—	x	x	—	—	—
Healdia menisca Cooper	—	x	—	—	—	—	—	—	—
Healdia minuta Cooper	—	x	—	—	—	—	—	—	—
Healdia mucronata Cooper	—	—	x	—	—	—	—	—	—
Healdia opima Croneis and Gale	—	—	x	—	—	—	—	—	—
Healdia ornata Morey	—	—	x	x	—	x	—	—	6, 7
Healdia ovoidea Cooper	x	—	x	—	—	—	—	—	—
Healdia radinula Cooper	—	x	—	—	—	—	—	—	—
Healdia simplex Roundy	—	—	—	—	—	—	—	—	6
Healdia subcarinata Morey	—	—	—	—	—	—	—	—	7
Healdia tenuicosta Cooper	—	—	—	—	x	x	x	x	—
Healdia vinitaensis Harlton	—	—	—	—	x	—	—	—	3
Incisurella lata Cooper	x	x	—	—	—	—	—	—	—
Incisurella prima Cooper	x	x	—	—	—	—	—	—	—
Macrocypris acuminata Cooper	—	—	—	—	—	x	—	—	—
Macrocypris biconcava Croneis and Gutke	x	—	—	—	—	—	—	—	—
Macrocypris chapmani Croneis and Bristol	—	—	—	—	—	x	—	—	—
Macrocypris ovata Cooper	—	—	—	—	—	—	—	x	—
Macrocypris reginni Coryell and Johnson	—	—	—	—	—	—	x	x	—
Microcheilinella cordata Cooper	—	—	—	—	—	—	—	x	—
Microcheilinella? exilis Cooper	x	—	—	—	—	—	—	—	—
Microcheilinella obesa Cooper	—	x	—	—	—	x	—	x	—
Microcheilinella pergracilis Croneis and Gale	—	—	x	—	x	—	—	—	3
Microcheilinella subcorbuloides (Jones and Kirkby)	—	—	—	—	—	—	—	—	1, 8
Microcheilinella tumida Cooper	—	x	x	—	x	—	—	x	3
Seminolites ovalis Cooper	x	—	—	—	—	—	—	—	—
Seminolites? reversus Cooper	—	—	x	—	—	—	—	—	—
Seminolites sohni Croneis and Bristol	—	—	x	—	—	x	—	—	3
Seminolites symmetricus Cooper	—	x	—	—	—	—	—	—	—
Tetratylus ellipticus Cooper	—	x	—	—	—	—	—	—	—
Tetratylus elongatus Cooper	—	x	—	—	—	—	—	—	—
Tetratylus menardensis (Croneis and Bristol)	—	x	—	—	—	x	—	—	—
BEYRICHIIDAE									
Beyrichia contracta Cooper	—	—	x	—	—	—	—	—	—
Beyrichia placida Croneis and Gale	—	—	x	—	—	—	—	—	6
Beyrichia sagitta Cooper	—	x	—	—	—	—	—	—	—

Species	Renault	Paint Creek	Golconda	Glen Dean	Vienna	Menard	Clore	Kinkaid	Others[a]
CYTHERELLIDAE									
Cavellina bransoni (Morey)	—	—	—	—	—	—	—	x	7
Cavellina congruens Cooper	—	—	—	—	—	—	x	—	—
Cavellina coryelli Croneis and Gale	—	—	x	—	—	—	x	—	—
Cavellina dispar Cooper	—	—	—	—	—	x	—	—	—
Cavellina exila Cooper	x	—	—	—	x	x	x	—	6
Cavellina geisi (Croneis and Gale)	—	—	x	—	x	—	—	—	—
Cavellina glandella (Whitfield)	—	—	—	—	—	—	—	x	2
Cavellina hoeniri Coryell and Johnson	—	—	—	—	—	—	x	—	—
Cavellina ithunnae Coryell and Johnson	—	—	—	—	—	—	x	—	—
Cavellina librata Cooper	—	—	—	—	—	—	x	—	—
Cavellina longula Cooper	—	—	x	—	—	—	—	—	—
Cavellina ovatiformis (Ulrich)	—	cf.	—	—	cf.	cf.	x	x	3
Cavellina parallela Croneis and Gutke	x	x	—	x	—	—	—	—	—
Cavellina parva Cooper	—	—	—	—	x	—	—	—	6
Cavellina perplexa Croneis and Funkhouser	—	x	x	—	x	x	x	—	4, 6
Cavellina spatulata Croneis and Gutke	x	—	x	—	—	—	—	—	—
Paracavellina elliptica Cooper	—	—	x	—	—	—	—	—	—
Paracavellina opima Cooper	—	x	—	—	—	—	—	—	—
Paracavellina ovata Cooper	—	—	—	—	—	x	—	—	—
Paracavellina pinguis Cooper	—	—	x	—	—	—	—	—	—
Paracavellina tumida Cooper	—	x	—	—	—	—	—	—	—
Platychilus ovoides Cooper	—	—	—	—	x	—	—	—	—
Sargentina allani Coryell and Johnson	—	—	—	—	—	—	x	—	—
Sargentina asulcata Cooper	—	—	—	—	—	—	—	x	—
Sargentina crassimarginata (Croneis and Thurman)	—	—	—	—	—	—	—	x	—
Sulcella celsa Cooper	—	x	—	—	—	—	—	—	—
Sulcella nodocosta Cooper	—	x	—	—	—	—	—	—	—
Sulcella ovata Cooper	—	x	—	—	—	—	—	—	
DREPANELLIDAE									
Cornigella golcondensis (Croneis and Gale)	—	x	x	—	x	x	—	—	—
Golcondella sulcata Croneis and Gale	—	—	x	—	—	—	—	—	—
GLYPTOPLEURIDAE									
Glyptopleura adunca Croneis and Thurman	—	—	—	—	—	—	—	x	—
Glyptopleura alata Croneis and Funkhouser	—	—	—	—	—	—	x	—	—
Glyptopleura alternata Croneis and Funkhouser	—	—	—	—	—	—	x	x	—
Glyptopleura alvea Cooper	—	—	—	—	—	—	—	x	—
Gluptopleura angulata Girty	—	—	—	—	—	—	—	—	4
Glyptopleura bristoli Croneis and Gutke	x	x	—	—	—	—	—	—	—
Glyptopleura carrolli Croneis and Bristol	—	—	—	—	—	x	—	—	—
Glyptopleura circumcostata Cooper	—	—	—	—	—	—	—	x	—
Glyptopleura complexa Croneis and Funkhouser	—	—	—	—	x	x	x	x	—
Glyptopleura compta Croneis and Thurman	—	—	—	—	—	—	x	x	—
Glyptopleura conflexacostata Croneis and Gale	—	x	x	—	x	x	—	x	—
Glyptopleura? curvata Croneis and Gale	—	—	x	—	—	—	—	—	—
Glyptopleura decacostata Croneis and Gale	—	—	x	—	—	—	—	—	—
Glyptopleura elliptica Croneis and Gutke	x	—	—	—	—	—	—	—	—
Glyptopleura elongata Cooper	—	—	—	—	—	—	x	—	—
Glyptopleura friggae Coryell and Johnson	—	—	—	—	—	—	x	—	—
Glyptopleura gibba Croneis and Gale	—	x	x	—	—	—	—	—	—
Glyptopleura harltoni Croneis and Bristol	—	—	—	—	—	x	—	x	—
Glyptopleura henbesti Croneis and Gutke	x	—	—	—	—	—	—	—	—

Species	Renault	Paint Creek	Golconda	Glen Dean	Vienna	Menard	Clore	Kinkaid	Others[a]
Glyptopleura inoptina Girty	—	—	—	—	—	—	x	—	4
Glyptopleura intermedia Croneis and Gale	—	—	x	x	—	—	—	—	—
Glyptopleura kayi Croneis and Bristol	—	—	—	—	—	x	—	—	—
Glyptopleura kellettae Croneis and Thurman	—	—	—	—	—	—	x	x	—
Glyptopleura multicostata Morey	—	—	—	—	—	—	x	—	7
Glyptopleura cf. pentacostata Croneis and Gale	—	—	x	—	—	—	—	—	—
Glyptopleura pseudosulcata Croneis and Thurman	—	—	—	—	—	x	—	x	—
Glyptopleura reniformis Croneis and Thurman	—	—	—	—	—	—	—	x	—
Glyptopleura resupinata Croneis and Bristol	—	—	—	—	—	x	—	—	—
Glyptopleura sagae Coryell and Johnson	—	—	—	—	—	—	x	—	—
Glyptopleura schizopleura Coryell and Sohn	—	—	—	—	—	—	—	—	6
Glyptopleura similis Croneis and Funkhouser	—	—	—	—	—	—	x	—	—
Glyptopleura spinosa (Jones and Kirkby)	—	—	—	—	—	x	—	—	8
Glyptopleura symmetrica Croneis and Funkhouser	—	—	—	—	—	—	x	x	—
Glyptopleura teretiformis Croneis and Thurman	—	—	—	—	—	—	—	x	—
Glyptopleura tyri (Coryell and Johnson)	—	—	—	—	—	—	x	—	—
Glyptopleura variacostata Croneis and Thurman	—	—	—	—	—	x	—	x	—
Glyptopleura varians Croneis and Funkhouser	—	—	—	—	—	x	x	x	—
Glyptopleura venosa (Ulrich)	—	—	—	x	—	—	—	x	—
Glyptopleurina? bulbosa Croneis and Gale	—	—	x	x	—	—	—	—	—
Glyptopleurina complexa Croneis and Bristol	—	—	—	x	—	x	—	—	—
Glyptopleurina coryelli Croneis and Gutke	x	—	x	—	—	—	—	—	—
Glyptopleurina flexuosa Cooper	—	x	—	—	—	—	—	—	—
Glyptopleurina iniqua Cooper	—	—	—	—	x	—	—	—	—
Glyptopleurina insculpta (Croneis and Funkhouser)	—	—	—	—	—	—	x	x	—
Glyptopleurina insignis (Croneis and Gale)	—	—	x	—	—	—	—	—	—
Glyptopleurina longuronis Cooper	x	—	—	—	—	—	—	—	—
Glyptopleurina oehersi (Croneis and Bristol)	—	—	x	—	x	x	—	—	—
Glyptopleurina ornata (Croneis and Gale)	—	—	x	x	—	—	—	—	—
Glyptopleurina simplex Croneis and Bristol	—	—	—	—	x	x	—	—	—
Glyptopleurina simulans Croneis and Gutke	x	—	—	—	—	—	—	—	—
Glyptopleurina simulatrix (Ulrich)	—	x	x	—	—	—	—	—	—
Glyptopleurina vetula Cooper	—	—	x	—	—	—	—	—	—
Glyptopleuroides girtyi Croneis and Gutke	x	—	—	—	—	—	—	—	—
Glyptopleuroides insculptus Croneis and Gale	—	—	x	x	—	—	—	—	—
Glyptopleuroides perplexus Croneis and Gutke	x	—	—	—	—	—	—	—	—
Mesoglypha mediocre Cooper	—	—	—	x	—	—	—	—	—
Venula striata (Croneis and Funkhouser)	—	—	—	—	—	—	x	x	—
GRAPHIADACTYLLIDAE									
Graphiadactyllis arkansana (Girty)	—	—	—	—	—	—	—	—	1, 3, 4
Graphiadactyllis tenuis Cooper	—	—	—	—	—	—	—	—	3
HOLLINELLIDAE									
Hollinella granifera (Ulrich)	x	—	—	—	—	—	—	—	—
Hollinella longispina (Jones and Kirkby)	x	—	—	—	—	—	—	—	8
Hollinella radiata (Jones and Kirkby)	—	—	—	x	x	x	x	x	3, 7, 8
KIRKBYIDAE									
Amphissites carinatus Cooper	—	—	x	x	—	—	—	—	4
Amphissites chappelensis Roundy	—	—	—	—	—	—	—	—	1
Amphissites exiguus Cooper	—	—	—	—	—	—	—	x	—
Amphissites golcondensis Croneis and Gale	—	x	x	—	—	—	—	—	—
Amphissites insignis Croneis and Thurman	—	—	—	—	—	—	—	x	—

Species	Renault	Paint Creek	Golconda	Glen Dean	Vienna	Menard	Clore	Kinkaid	Others[a]
Amphissites latinodus Croneis and Bristol	—	—	—	—	?	x	—	x	—
Amphissites quadratus Cooper	—	—	—	—	—	—	—	x	—
Amphissites rugosus Girty	—	—	—	—	—	—	—	x	3, 4
Amphissites simplex (Girty)	—	—	—	—	—	—	—	—	4
Balantoides moreyi Croneis and Funkhouser	—	—	—	—	—	—	x	—	—
Balantoides quadrilobus Morey	—	—	—	—	—	—	—	—	7
Balantoides reticulatus Croneis and Thurman	—	—	—	—	—	—	—	x	—
Discoidella ampla Cooper	x	—	—	—	—	—	—	—	—
Discoidella pendens Croneis and Gutke	x	x	—	—	—	—	—	—	—
Discoidella simplex Croneis and Gale			x	—	—	—	—	—	—
Ectodemites bicarinatus (Croneis and Thurman)	—	—	—	—	x	x	—	x	—
Ectodemites costelliferus (Croneis and Bristol)	—	—	x	—	x	x	—	—	—
Ectodemites elongatus Cooper	—	—	—	—	—	—	—	x	—
Ectodemites magnireticulatus Cooper	—	x	—	—	—	—	—	—	—
Ectodemites monomastadis (Coryell and Sohn)	—	—	—	—	—	cf.	—	—	6
Ectodemites obesus (Croneis and Gale)	x	x	x	—	—	—	—	—	—
Ectodemites oblongus (Jones and Kirkby)	—	—	—	x	x	—	—	—	8
Ectodemites oblongus transversalis (Girty)	—	—	—	—	—	—	—	—	3
Ectodemites parvus Cooper	—	—	—	—	—	x	—	—	—
Ectodemites planus Cooper	—	x	x	—	—	—	—	—	—
Ectodemites primus Cooper	—	—	—	—	—	—	—	x	—
Ectodemites quadratus Cooper	—	x	—	—	—	—	—	—	—
Ectodemites robertsi (Morey)	—	—	—	—	—	—	—	—	7
Ectodemites tumidus Cooper	—	—	—	—	—	—	x	x	—
Ectodemites warei (Morey)	—	—	—	—	—	—	x	x	7
Kirkbya aequalis Croneis and Funkhouser	—	—	—	—	—	x	x	—	—
Kirkbya bifrons Croneis and Thurman	—	—	—	—	—	—	—	x	—
Kirkbya elongata Cooper	—	x	—	—	—	—	—	—	—
Kirkbya fossula Croneis and Bristol	—	—	—	—	x	x	—	—	—
Kirkbya humerosa Cooper	—	—	—	—	—	—	—	x	—
Kirkbya intermedia Croneis and Thurman	—	—	—	—	—	—	—	x	—
Kirkbya marginata Croneis and Funkhouser	—	—	—	—	—	—	x	—	—
Kirkbya cf. reflexa Girty	—	—	cf.	—	—	—	—	—	3
Kirkbya regularia Croneis and Gale	—	—	x	—	—	—	—	—	—
Kirkbya symmetrica Croneis and Thurman	—	—	—	—	—	x	—	x	—
Kirkbya turrita Croneis and Gale	—	—	x	—	—	—	—	—	—
Kirkbyella gutkei Croneis and Bristol	—	—	—	x	—	x	x	—	—
Kirkbyella quadrata Croneis and Gutke	x	—	x	—	x	—	—	—	—
Kirkbyella sulcata Cooper	—	x	—	—	—	—	—	—	—
Kirkbyella truncata Cooper	—	—	—	—	—	x	—	—	—
Polytylites ambitus Cooper	x	—	—	—	—	—	—	—	—
Polytylites biforatus (Croneis and Thurman)	—	—	x	—	—	—	—	x	—
Polytylites bradfieldi (Croneis and Funkhouser)	x	—	—	—	x	x	x	x	—
Polytylites concavus (Croneis and Bristol)	—	—	—	—	—	x	—	—	—
Polytylites crassus Cooper	—	—	—	—	—	—	—	x	—
Polytylites directus Cooper	—	—	—	x	—	—	—	—	—
Polytylites diversus Cooper	—	—	—	—	x	—	—	—	—
Polytylites elongatus (Croneis and Bristol)	—	—	—	—	—	x	—	x	—
Polytylites fossilis (Croneis and Thurman)	x	x	x	—	—	—	—	x	—
Polytylites geniculatus Cooper	x	—	—	—	x	—	—	—	—
Polytylites grovei (Croneis and Gutke)	x	—	—	—	—	—	—	—	—
Polytylites nodobliquus (Croneis and Gale)	x	x	x	—	x	—	—	—	—
Polytylites quincollinus (Harlton)	x	—	—	—	x	x	—	x	3
Polytylites reticulatus Cooper	—	—	—	—	—	—	x	—	—
Polytylites similis (Croneis and Gale)	—	—	x	—	—	—	—	—	—

Species	Renault	Paint Creek	Golconda	Glen Dean	Vienna	Menard	Clore	Kinkaid	Others[a]
Polytylites sublineatus (Croneis and Thurman)	—	—	—	—	—	—	—	x	—
Polytylites superus (Croneis and Gale)	—	—	x	x	—	x	—	—	—
Polytylites tricollinus (Jones and Krikby)	—	—	—	x	—	—	—	—	8
Polytylites trilobus (Croneis and Gale)	—	—	x	—	—	—	—	—	—
Polytylites wilsoni (Croneis and Gutke)	x	—	—	—	—	—	—	x	—
Savagella? acuminata Cooper	x	—	x	—	x	x	—	—	—
Savagella lindahli (Ulrich)	—	—	—	—	—	—	—	—	1
Savagella rhomboidalis (Girty)	—	—	—	—	—	—	—	—	2
KLOEDENELLIDAE									
Chesterella exuta Croneis and Gutke	x	—	—	—	—	—	—	—	—
Chesterella fissurata Croneis and Gutke	x	—	—	—	—	—	—	—	—
Chesterella? incerta Cooper	x	—	—	—	—	—	—	—	—
Deloia serrata Croneis and Thurman	—	—	—	—	—	—	—	x	6
Deloia spinosa Croneis and Bristol	x	—	—	?	x	x	—	x	—
Deloia sulcata Croneis and Funkhouser	—	—	x	—	—	—	x	—	1
Deloia tumida Cooper	—	—	—	—	—	—	—	x	—
Denisonia brevicosta Cooper	—	—	x	—	—	—	—	—	—
Denisonia cincta Croneis and Bristol	—	—	—	—	—	x	cf.	—	4
Denisonia cirrata Cooper	—	—	x	—	—	—	—	—	—
Geffenina johnsoni Coryell and Sohn	—	—	—	—	—	—	—	—	6
Geffenina marmerae Coryell and Sohn	—	—	—	—	—	—	—	—	6
Geffenina? praelonga Cooper	—	—	x	—	—	—	—	—	—
Geffenites jungae Coryell and Sohn	—	—	—	—	—	—	—	—	6
Geffenites mammoides Coryell and Sohn	—	—	—	—	—	—	—	—	6
Gillina vitharri Coryell and Johnson	—	—	—	—	—	—	x	—	—
Jonesina craterigera (Brady)	—	—	x	x	—	—	—	—	—
Jonesina equilatera Cooper	—	x	—	—	—	—	—	—	—
Jonesina intermedia Croneis and Bristol	—	—	—	—	x	x	—	—	—
Jonesina lalickeri Croneis and Bristol	—	—	—	—	—	x	—	—	—
Jonesina odini Coryell and Johnson	—	—	—	—	—	—	x	—	—
Jonesina persulcata Croneis and Gale	—	—	x	—	—	—	—	—	—
Jonesina puncta Morey	—	—	—	—	—	—	x	—	7
Junesina reticulata Harlton	—	—	—	—	—	—	—	—	4
Jonesina spinigera Cooper	—	x	x	—	—	?	—	—	—
Jonesina spinosa Croneis and Funkhouser	—	—	—	—	—	—	x	—	—
Jonesina tenuisinuosa Cooper	—	—	x	—	—	—	—	—	—
Kloedenella macer Cooper	—	—	—	x	—	—	—	—	—
Kloedenellina heimdalli Coryell and Johnson	—	—	—	—	—	—	x	—	—
Knightina neglecta Croneis and Gale	—	—	x	—	—	—	—	—	—
Knightina pinguoides Croneis and Gale	—	—	x	—	—	—	—	—	—
Knoxina inflata Croneis and Gale	x	—	x	—	—	—	—	—	—
Knoxina rogatzi Croneis and Gutke	x	—	—	—	—	—	—	—	—
Lochriella fenriri (Coryell and Johnson)	—	—	—	—	—	—	x	—	—
Lochriella reversa (Morey)	—	—	—	—	—	—	x	—	3, 6
Neokloedenella? magna Cooper	—	—	x	—	—	—	—	—	—

Species	Renault	Paint Creek	Golconda	Glen Dean	Vienna	Menard	Clore	Kinkaid	Others[a]
Neokloedenella prima Croneis and Funkhouser	—	x	—	—	—	—	x	x	6
Neokloedenella secunda Croneis and Bristol	—	—	—	?	x	x	—	—	6
Neokloedenella subquadrata Croneis and Gutke	x	—	—	—	—	—	—	—	—
Oliganisus geisi Croneis and Gutke	x	x	—	—	—	—	—	—	—
Perprimitia? bicornis Croneis and Gale	—	—	x	—	—	—	—	—	—
Perprimitia elongata Cooper	—	x	—	—	—	—	—	—	—
Perprimitia funkhouseri Croenis and Thurman	—	—	—	—	—	—	x	x	—
Perprimitia matheri Croneis and Bristol	—	—	x	x	x	x	—	—	—
Perprimitia robusta Croneis and Gale	x	x	x	—	—	—	—	—	—
Perprimitia sigynae (Coryell and Johnson)	—	—	—	—	—	—	x	—	—
Perprimitia tenera Cooper	—	—	x	x	—	—	—	—	—
Perprimitia turrita Croneis and Gutke	x	—	x	—	x	—	—	—	—
Sansabella ampla Cooper	—	x	—	—	—	—	—	—	—
Sansabella amsdenensis Morey	—	—	—	—	—	—	—	—	7
Sansabella bradfieldi (Coryell and Sohn)	—	—	x	cf.	—	x	—	x	3, 6
Sansabella declivis Cooper	—	—	x	—	—	—	—	—	—
Sansabella? dubia Morey	—	—	—	—	—	—	—	—	7
Sansabella elongata Cooper	—	x	—	—	—	—	—	—	—
Sansabella harrisi Croneis and Funkhouser	—	—	—	—	—	—	x	x	3
Sansabella lenticularis Cooper	—	—	—	—	—	—	x	—	—
Sansabella njorthi (Coryell and Johnson)	—	—	—	—	—	—	x	—	—
Sansabella ovata Cooper	—	x	—	—	—	—	—	—	—
Sansabella parallela Cooper	—	—	—	—	x	—	—	—	—
Sansabella sulcata Roundy	—	—	—	—	—	—	—	—	1, 4
Sansabella truncata Cooper	—	—	x	—	—	—	—	—	—
Sansabella tumida Coryell and Sohn	—	—	—	—	—	x	—	—	6
Sansabella vinitaensis (Harlton)	x	—	—	—	—	—	—	—	3, 4
LEPERDITELLIDAE									
Cyathus vetustus Cooper	—	x	—	—	—	—	—	—	—
Microcoelonella scanta Coryell and Sohn	—	—	—	—	—	—	—	—	6
Microparaparchites erectus Cooper	—	—	x	—	?	x	x	—	—
Microparaparchites inornatus Croneis and Bristol	—	—	—	—	x	x	x	—	—
Microparaparchites spinosus Croneis and Gale	—	—	x	x	—	x	—	—	—
Paraparchites cyclopeus (Girty)	x	—	x	—	—	—	—	—	3
Paraparchites gibbus Bell	—	—	—	—	—	—	—	—	5
Paraparchites inornatus (McCoy)	x	cf.	x	x	—	—	—	—	3
Paraparchites kinkaidensis Croneis and Thurman	—	—	—	—	—	x	—	x	—
Paraparchites nicklesi (Ulrich)	?	—	x	x	—	—	x	x	2, 4, 6, 7
Paraparchites ovatus Cooper	—	—	—	—	—	—	x	—	—
Proparaparchites fabulus Cooper	x	—	—	—	—	—	—	—	—
Proparaparchites ovatus Cooper	—	—	—	—	—	—	—	x	—
Pseudoparaparchites? aclis Croneis and Thurman	—	—	—	—	—	—	—	x	—
PRIMITIIDAE									
Carboprimitia campa Cooper	—	—	—	—	—	x	—	—	—
Carboprimitia depressa Croneis and Funkhouser	—	—	—	—	x	x	x	x	6
Carboprimitia longula Cooper	—	—	—	—	—	—	x	—	—
Carboprimitia rotunda Croneis and Funkhouser	—	—	—	—	cf.	x	x	x	—
Carboprimitia simulans Croneis and Bristol	—	—	—	—	x	x	x	x	—

Species	Renault	Paint Creek	Golconda	Glen Dean	Vienna	Menard	Clore	Kinkaid	Others[a]
Coryellina elegans (Croneis and Gutke)	x	—	—	—	—	—	—	—	—
Halliella? retiferiformis Girty	—	—	—	—	—	—	—	—	3
Primitia cestriensis Ulrich	—	—	—	?	—	—	—	—	—
Primitia cestriensis caldwellensis Ulrich	—	—	—	—	—	—	?	—	—
Primitia fayettevillensis Girty	—	—	—	—	—	—	—	—	3
Primitia granimarginata Ulrich	—	—	—	?	—	—	—	—	—
Primitia seminalis Girty	—	—	—	—	—	—	—	—	1, 2, 3
Primitia simulans Ulrich	—	—	—	?	—	—	—	—	—
Primitia subaequata Ulrich	—	—	—	—	—	—	?	—	—
Tetrasacculus mirablilis (Croneis and Gale)	—	—	x	x	—	—	—	—	—
YOUNGIELLIDAE									
Moorea? circincta Cooper	—	x	—	—	—	—	—	—	—
Moorea granosa Ulrich	—	—	—	x	—	—	—	—	—
Moorites brevis Cooper	—	—	—	—	x	—	—	—	—
Moorites convexus Cooper	—	x	—	—	—	—	—	—	—
Moorites elongatus Cooper	x	x	—	—	—	—	—	—	—
Moorites intermedius Cooper	x	—	—	—	—	—	—	—	—
Moorites rhomboidalis (Croneis and Bristol)	cf.	x	x	x	x	x	x	x	3, 6

[a]The last column shows scattered occurrences outside of Illinois, as follows: 1. Barnett shale, San Saba County, Texas; 2. Batesville sandstone, Arkansas; 3. Fayetteville shale, Arkansas; 4. Fayetteville shale, Oklahoma; 5. Lower Windsor series, Ontario; 6. Reynolds (Mauch Chunk) formation, Morgantown, West Virginia; 7. Amsden formation, Wyoming; and 8. Lower Carboniferous formations, Great Britain.

COLLECTING LOCALITIES

1. SW. ¼ NW. ¼ sec. 30, T. 7 S., R. 6 W., Randolph County, Illinois. Glen Dean formation (just below upper ledge of Okaw limestone). Collection No. 50.
2. SW. ¼ sec. 4, T. 6 S., R. 8 W., Randolph County, Illinois. Paint Creek formation along Mississippi River bluffs. Collection No. 155.
3. SE. ¼ NE. ¼ sec. 20. T. 12 S.. R. 3 E., Johnson County, Illinois. Kinkaid formation, ½ mile south of Veatch school. Collection No. 320.
4. SE. ¼ SW. ¼ sec. 15, T. 7 S., R. 6 W., Randolph County, Illinois. Clore formation. Collection No. 152.
5. NE. ¼ NW. ¼ sec. 30 and SE. ¼ SW. ¼ sec. 19, T. 12 S., R. 5 E., Pope County, Illinois. Kinkaid formation in railroad cut at Robbs. Collection Nos. 7, 314.
6. NE. ¼ SW. ¼ sec. 35, T. 8 S., R. 4 W., Jackson County, Illinois. Kinkaid formation in abandoned quary. Collection No. 53.
7. SE. ¼ SW. ¼ sec. 28, T. 11 S., R. 1 W., Union County, Illinois. Menard formation. Collection No. 157.
8. NE. ¼ NW. ¼ sec. 20, T. 5 S., R. 8 W., Randolph County, Illinois. Golconda formation, on east side of new highway bridge. Collection No. 156.
9. SE. ¼ SW. ¼ sec. 11, T. 12 S., R. 7 E., ½ mile south of Eichorn, Hardin County, Illinois. Renault formation. Collection No. 4.
10. SE. ¼ SW. ¼ sec. 26, T. 11 S., R. 1 W., Union County, Illinois. Vienna formation. Collection No. 160.
11. NW. ¼ NW. ¼ sec. 15, T. 11 S., R. 9 E., Hardin County, Illinois. Glen Dean formation. Collection No. 310.
12. NW. ¼ NW. ¼ sec. 3, T. 14 S., R. 3 E., Massac County, Illinois. Renault formation. Collection No. 328.
13. NE. ¼ SW. ¼ sec. 9, T. 12 S., R. 1 W., Union County, Illinois. Renault formation. Collection No. 304.
14. NE. ¼ SW. ¼ sec. 23, T. 4 S., R. 9 W., Monroe County, Illinois. Renault formation. Collection No. 153.
15. SW. ¼ NE. ¼ sec. 1, T. 13 S., R 4 E., Johnson County, Illinois. Menard formation at south entrance to railroad tunnel. Collection No. 322.
16. SW. ¼ NW. ¼ sec. 13, T. 12 S., R. 1 W., Union County, Illinois. Golconda formation. Collection No. 307.
17. SW. ¼ SE. ¼ sec. 5, T. 13 S., R. 7 E., Pope County, Illinois. Type locality Golconda formation in Ohio River bluff near Rock Quarry school. Collection No. 318.
18. SE. ¼ SW. ¼ sec. 32, T. 5 S., R. 8 W., Randolph County, Illinois. Okaw (Golconda) and Paint Creek formation. Collection No. 49.
19. NE. ¼ SW. ¼ NW. ¼ sec. 28, T. 13 S., R. 3 W., Johnson County, Illinois. Golconda formation. Collection Nos. 40, 324.
20. NW. ¼ NE. ¼ sec. 2, T. 7 S., R. 7 W., Randolph County, Illinois. Menard formation. Collection No. 313.
21. SE. cor. I-30, 9 miles east of Greenville, Muhlenberg County, Kentucky. Phillips-Shearn No. 3, Golconda and Paint Creek formations, well cuttings. Collection No. 32.
22. NW. ¼ NW. ¼ sec. 3, T. 14 S., R. 6 E., Pope County, Illinois. Golconda formation in road cut 0.8 mile north of Homberg. Collection No. 315.
23. SW. ¼ NW. ¼ NW. ¼ sec. 27, T. 6 S., R. 6 W., Randolph County, Illinois. Badger-Schroeder No. 1, well cuttings. Collection No. 2995 (Subsurface Division).
24. NE. ¼ NW. ¼ SE. ¼ sec. 16, T. 4 S., R. 2 E., Jefferson County, Illinois. Benedum-Trees Jefferson No. 1, core samples, Paint Creek formation, depth 2454. Collection No. 14.
25. SW. ¼ SE. ¼ sec. 5, T. 13 S., R. 8 E., Hardin County, Illinois. Renault (Shetlerville?) formation, at loading docks for fluorspar southwest of Rosiclare. Collection No. 309.
26. SW. ¼ SE. ¼ sec. 34, T. 11 S., R. 1 W., Union County, Illinois. Clore formation. Collection No. 161.
27. CWL., SW. ¼ sec. 33, T. 10 S., R. 8 E., Gallatin County, Illinois. Clore formation. Collection No. 150.
28. W. ½ SW. ¼ NW. ¼ sec. 5, T. 6 S., R. 1 W.. Perry County, Illinois. H. Forester No. 1 core; top Kinkaid formation (618 ft.) to base Renault (1458 ft.). Collection No. 2.
29. NE. ¼ NE. ¼ sec. 26, T. 25 N., R. 20 E., Oklahoma. Fayetteville shale. Collection No. 207.
30. SE. ¼ SW. ¼ sec. 2, T. 7 S., R. 7 E., Randolph County, Illinois. Menard formation. Collection No. 312.
31. North end of cut along Frisco Railroad, between Maple and Douglas streets, Fayetteville, Arkansas. Upper Fayetteville shale. Collection No. 209.
32. SW. ¼ SW. ¼ sec. 29, T. 7 S., R. 6 W., Randolph County, Illinois. Menard formation. Collection No. 51.
33. Near cen. sec. 27, T. 17 N., R. 29 W., northeast of Fayetteville, Arkansas. Habberton collecting locality, near base of Fayetteville shale. Collection No. 211.
34. S. of cen., SE. ¼ sec. 16. T. 17 N., R. 29 W., northeast of Fayetteville, Arkansas. U. S. G. S. green loc. 1339a.
35. Greer quarry, 6½ miles southeast of Morgantown, West Virginia. Near top of Reynolds formation, Mauch Chunk series. Collection No. 31.
36. NW. ¼ SE. ¼ sec. 12, T. 13 S., R. 4 E., Johnson County, Illinois. On west side of railroad cut 50 feet north of "RW" post. Vienna formation. Collection No. 325.
37. NW. ¼ SW. ¼ NE. ¼ sec. 33, T. 7 S., R. 6 W., Randolph County, Illinois. Quarry 3½ miles southeast of Chester. Clore formation. Collection No. 52.
38. SW. ¼ SE.¼ SE. ¼ sec. 5, T. 13 S., R. 7 E., Pope County, Illinois. Steep ravine ½ mile east of Rock Quarry School. Type locality of Golconda formation. Collection No. 9.
39. NW. ¼ NE. ¼ NW. ¼ sec. 22, T. 6 S., R. 6 W., Randolph County, Illinois. Small quarry, south bank Mary's River. Clore formation. Collection No. 311.

SYSTEMATIC DESCRIPTION

Three hundred and twenty-five species and one variety of ostracodes have been identified from the Chester series in Illinois, 126 of which are newly described in this report. All but 38 species and one variety of the previously described forms are represented in our collections. Descriptions of the new species are presented in the following pages together with redescriptions of 37 species known from other areas (including two from western Kentucky) which have been recognized in Illinois for the first time. In addition descriptions of two species from the Fayetteville shale, one of them new, and two species from the Reynolds formation of the Mauch Chunk series are included for purposes of comparison. One new subfamily and 10 new genera are proposed.

Illustrated on the plates are all of the new species, 117 species described by Croneis and associates and by Coryell and Johnson that are present in our collections, and 45 species described from other areas, all but four of which are known in Illinois.

The dimensions listed in the following descriptions refer to the holotypes of new species and the principal figured specimens of others.

Family Acronotellidae Swartz

Genus Monoceratina Roth

Monoceratina celsalobata Cooper, n. sp.

Plate 1, figures 23-26

Carapace elongate in lateral view, very thick; ends rounded with a slight forward swing; cardinal angles obtuse; dorsum and venter very slightly convex, subparallel; ventral lobe terminates just above the ventral margin and about the middle of the posterior half; hinge straight; greatest height and thickness just back of midlength; pit indistinguishable.

Length, 0.83 mm; height, 0.30 mm; thickness, 0.37 mm.

Golconda formation, locality 17, rare.

M. celsalobata is distinguished from *M. furcula* Croneis and Gale by the greater proportional length (form ratio) and by the relatively high position of the lobes.

Monoceratina opima Cooper, n. sp.

Plate 1, figures 29-32

Carapace short and thick, valves equal, elongate in lateral view, ovate to acuminate in ventral view; cardinal angles fairly prominent, anterior more obtuse, posterior of about 90 degrees, giving a slight forward swing; dorsum slightly convex, venter broadly so; hinge straight and slightly channelled; lobes terminate at and conform to ventral margin; greatest height and thickness back of midlength.

Length, 0.59 mm; height, 0.30 mm; thickness, 0.37 mm.

Renault formation, locality 9, rare.

This species is distinguished by its short, thick carapace and by the conformation of the spine-like lobe and the ventral margin.

Genus Triceratina Upson

Triceratina Upson, 1933, Nebraska Geol. Survey, Bull. 8, p. 29.

Monoceratina (part) Kellett, 1935, Jour. Paleontology, vol. 9, p. 157.

Pterocodella (part) Croneis and Gutke, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 40.

The presence of a trinodal ostracode in the basal Chester, described by Croneis and Gutke as *Pterocodella inconsueta,* throws an interesting light upon Upson's genus *Triceratina.* The Chester species possesses a large, prominent posterior node in addition to the spine-terminated ventral node, and a somewhat less prominent but wider dorsal node or swelling, the latter situated above the ventral node. The Chester specimens show these nodes to be quite constant, especially the ventral and dorsal ones, and therefore the question of the synonymy of these forms should be reopened. Bassler and Kellett (1934, p. 12) say that "Good generic characters are found in the lobation of the valve. . . . and variations in their development always afford good specific characters, and often distinguish genera"—the latter referring to lobes of the Beyrichiacea.

M. lewisi Harris and Lalicker agrees with the Renault species in all major features, differing only in minor structural details. While the shape, size, number, and position of nodes vary considerably between young moults and adult specimens, the presence of such prominent nodes on these species is significant. The occurrence, in the lowest Chester, of a species so similar to one from the highest Pennsylvanian and Permian beds, is important in that it

establishes the persistence of this genus throughout a considerable period of time. The common Chester *Monoceratina* agrees closely in general structural features and ornamentation with Roth's genotype from the lower Pennsylvanian.

Triceratina inconsueta (Croneis and Gutke)

Plate 1, figures 4-8

Pterocodella inconsueta Croneis and Gutke, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 40, pl. 1, figs. 7-9, Renault formation.

Length, 0.52 mm; height, 0.25 mm; thickness, 0.26 mm.

Renault formation, locality 9, rare; Menard formation, locality 20, rare.

The specimen illustrated is a topotype and is identical with the holotype, except for the somewhat greater swelling above the ventral lobe. This species resembles *Monoceratina lewisi* Harris and Lalicker from the Fort Riley limestone in its similarly sharp-ended ventral lobe and prominently rounded posterior lobe. Its dorsal swelling corresponds to the dorsal lobe of the latter species but it differs in possessing a more acuminate anterior end in lateral view and in the presence of a tubercle in the postero-dorsal angle.

Family Bairdiidae Sars

Genus Acratia Delo

Acratia mucronata Cooper, n. sp.

Plate 1, figures 40-42

Carapace long thin and smooth, lens-like in outline; ends sharply pointed and low (near ventral margin), the posterior end produced downward; hinge line straight or very slightly curved in centro-dorsal region, but not depressed as in *A. tumida;* articulation on ventral margin broadly but slightly curved; surface smooth.

Length, 0.98 mm; height, 0.39 mm; thickness, 0.44 mm.

Glen Dean formation, locality 1, rare.

Acratia obtusa Cooper, n. sp.

Plate 1, figures 1-3

Carapace large, elongate, thick and smooth; ends abruptly terminated without the tapering characteristic of other species; hinge straight, but not depressed; left valve slightly overlaps the right around entire margin except in the centro-dorsal portion; posterior end slightly produced downward.

Length, 0.80 mm; height, 0.35 mm; thickness, 0.38 mm.

Paint Creek formation, locality 2, rare.

Acratia tumida Cooper, n. sp.

Plate 1, figures 35-37

Carapace large, oval or lens-shaped in outline; thicker than wide, with largest dimensions central; centro-dorsal region slightly flattened; hinge line slightly depressed and strongly curved; left valve overlaps entire free margin, with greatest overlap ventral; hinge line strongly curved toward left in centro-dorsal portion; surface smooth.

Length, 1.10 mm; height, 0.58 mm; thickness, 0.58 mm.

Kinkaid formation, locality 3, common.

Genus Bairdia McCoy

Bairdia aculeata Cooper, n. sp.

Plate 1, figures 47-48

Bairdia sp. Jones and Kirkby, 1879, Quart. Jour. Geol. Soc. London, vol. 35, pl. 32, figs. 7, 8, Carboniferous of Great Britan.

Carapace large, with extremely long and straight postero-dorsal slope with inclination of 30-35° starting forward of the middle of the shell; dorsal overlap very conspicuous, that on venter much less so; point low and thin; hinge sinuous in dorsal view; greatest height forward of center.

Length, 1.10 mm; height, 0.51 mm; thickness, 0.39 mm.

Kinkaid formation, locality 3, common.

B. aculeata differs from other described species in the long postero-dorsal slope, occupying about three-fifths of the dorsal margin. The nearest known described form is the one figured as *Bairdia* sp. by Jones and Kirkby from Fife.

Bairdia aequa Cooper, n. sp.

Plate 1, figures 21-22

Carapace ovate, short and thick, with prominent antero-dorsal shoulder producing abrupt break in the curvature at this point; anterior end rounded; posterior end short and blunt; postero-dorsal slope about 60°; overlap most prominent along venter; hinge area depressed; greatest height forward of center; sides distinctly flattened in dorsal view; surface appears finely pitted.

Length, 0.85 mm; height, 0.49 mm; thickness, 0.38 mm.

Renault formation, locality 13, common.

This species may be distinguished by its flat, almost parallel sides.

Bairdia attenuata Girty

Plate 1, figures 33-34

Bairdia attenuata Girty, 1910, Ann. New York Acad. Sci., vol. 20, p. 237, Fayetteville shale.

Carapace very long and thin; central portion of ventral margin almost straight, upturned strongly to meet ends; anterior extremity rounded, posterior produced to sharp point directed slightly upward; extremities slightly below middle; dorsum convex in middle, sloping towards ends; postero-dorsal slope very low (35-40°).

Length, 1.0 mm; height, 0.46 mm; thickness, 0.29 mm.

Glen Dean formation, locality 1, common.

Although no figures of the type from the Fayetteville shale of Arkansas have been published, the Glen Dean form, by comparison with the holotype, is so close to it that there is little uncertainty concerning this identification.

Bairdia brevis Jones and Kirby

Plate 1, figures 11-12

Bairdia brevis Jones and Kirkby, 1867, Trans. Geol. Soc. Glasgow, vol. 2, p. 221; 1879. Geol. Soc. London, Quart. Jour., vol. 35, p. 575, pl. 31, figs. 1-8. Carboniferous of Great Britain.—Latham, 1932, Trans. Roy. Soc. Edinburgh, vol. 57, pt. 2, p. 377, Carboniferous of Scotland.

Carapace high and thick; strongly convex, dorsum highly arched, forming extremely long postero-dorsal slope inclined about 45°; posterior point very low, venter straight in middle and curved to meet ends; surface granulose.

Length, 1.0 mm; height, 0.60 mm; thickness, 0.43 mm.

Menard formation, locality 15, common.

Bairdia cestriensis Ulrich

Plate 1, figures 27-28

Bairdia cestriensis Ulrich, 1891, Cincinnati Soc. Nat. Hist., Jour., vol. 13, p. 210, pl. 17, figs. 6a-c, Chester series.—Girty, 1915, U. S. Geol. Survey, Bull. 595, p. 39, pl. 2, fig. 10, Batesville sandstone.

Bairdia cestriensis granulosa Girty, 1910, Ann. New York Acad. Sci., vol. 20, p. 237, Fayetteville shale.

Bairdia cooperi Croneis and Gale, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 287, pl. 6, figs 11, 12, Golconda formation.

Length, 1.45 mm; height, 0.73 mm; thickness, 0.58 mm.

Renault formation, locality 12, abundant; Golconda formation, locality 19, abundant; Glen Dean formation, locality 1, rare; Menard formation, locality 7, rare.

This species presumably described from the Glen Dean limestone near Grayson Springs, Kentucky, appears to be identical with forms found in the Renault, Golconda, Glen Dean, and Menard formations in the Illinois Chester and the lower Fayetteville of Arkansas. The granulose surface of Girty's specimens appears to be due to the character of the preservation.

Bairdia curvis Cooper, n. sp.

Plate 1, figures 43-44

Carapace elongate, tumid; ends rounded; dorsum arched, meeting anterior margin in smooth curve, posterior slope 45°, venter strongly concave, giving entire shell a decidedly bowed appearance.

Length, 1.14 mm; height, 0.46 mm; thickness, 0.41 mm.

Paint Creek formation, locality 32, depth 1304-1343 feet, common.

This species lies between *B. hisingeri* (Münster) and *B. subelongata* Jones and Kirkby; it is shorter and more rounded on the ends than the former; and higher and more bowed than the latter species. It is known only from the Golconda and Paint Creek formations from the wells in Muhlenberg County, where it is found associated with two species of *Bythocypris*.

Bairdia delicata Morey

Plate 1, figures 45-46

Bairdia delicata Morey, 1935, Jour. Paleontology, vol. 9, p. 480, pl. 54, figures 14, 16, Amsden formation.

Carapace elongate, tenuous; overlap most prominent along dorsal and ventral margins; venter straight, dorsum curving almost equally toward each end, anterior curve slightly more abrupt; antero-dorsal slope somewhat pronounced, forming angle at junction with anterior margin; posterior slope low (about 45°).

Length, 0.71 mm; height, 0.31 mm; thickness, 0.24 mm.

Menard formation, locality 20, common.

Bairdia granireticulata Harlton

Plate 1, figures 17-20

Bairdia granireticulata Harlton, 1929, Am. Jour. Sci., ser. 5, vol. 18, p. 267, pl. 2, figs. 10 a, b, Fayetteville shale.

Carapace tumid; dorsum broadly arched, with almost equal slope toward each end, venter curved; overlap around entire margin prominent except at anterior portion; antero-dorsal intersection slightly greater than 90°; postero-dorsal slope about 50°; posterior end short, sharp, slightly upturned; surface granulose.

Length, 1.17 mm; height, 0.53 mm; thickness, 0.43 mm.

Golconda formation, locality 17, common; Paint Creek formation, locality 18, common.

Bairdia impendere Cooper, n. sp.

Plate 2, figures 7-8

Carapace short and high with strong overlap around the entire margin, particularly on the postero-dorsal portion; dorsum strongly curved, venter almost straight; hinge and articulation form broad curve in dorsal view; terminal projection somewhat long and very low, one-fourth the height of the shell above the venter; greatest height forward of center, greatest length just below center; postero-dorsal slope about 55°; surface smooth.

Length, 1.23 mm; height, 0.80 mm; thickness, 0.50 mm.

Renault formation, locality 14, rare.

Bairdia insolens Cooper, n. sp.

Plate 2, figures 1-2

Carapace elongate, dorsum curved, venter straight; antero-ventral margin meeting upper and lower margins at an angle; overlap prominent around entire margin, including hinge; posterior projection short and low; postero-dorsal slope about 55°; surface smooth.

Length, 1.44 mm; height, 0.73 mm; thickness, 0.50 mm.

Renault formation, locality 12, common.

This form may be distinguished by its complete overlap and the unusual curvature of the anterior end.

Bairdia sinuosa Cooper, n. sp.

Plate 2, figures 11-12

Carapace ovate, tumid; left valve overlaps right except at apex of dorsum and at posterior ventral corner; in dorsal view hinge and overlap form smooth, sinuous curve; dorsum slightly curved, right valve projecting slightly above hinge; postero-dorsal slope about 50°; ventral margin straight; anterior margin curved; greatest height at center, greatest length slightly above center; posterior projection short, located below center line; surface smooth.

Length, 1.0 mm; height, 0.51 mm; thickness, 0.40 mm.

Clore formation, locality 52, common; Kinkaid formation, locality 5, abundant.

B. sinuosa might be confused with *B. cestriensis* Ulrich but it does not possess the depressed hinge line of the latter species.

Bairdia cf. subelongata Jones and Kirkby

Plate 2, figures 3-4

Bairdia subelongata Jones and Kirkby, 1879, Quart. Jour., Geol. Soc. London, vol. 35, p. 573, pl. 30, figs. 1-11, 16, Carboniferous of Great Britain.

Carapace thin, rounded anteriorly, slender and tapering posteriorly; postero-dorsal slope low (ca. 35°), venter gently convex; overlap not conspicuous.

Length, 1.30 mm; height, 0.52 mm; thickness, 0.40 mm.

Golconda formation, locality 19, common.

Bairdia subtila Cooper, n. sp.

Plate 2, figures 5-6

Carapace wide, dorsum acutely arched, especially posteriorly; postero-dorsal slope 50°, venter concave and strongly overlapped; intersection of anterior and dorsal margins about 90°; greatest height central; greatest thickness in middle of posterior half; posterior projection very poorly developed.

Length, 1.27 mm; height, 0.53 mm; thickness, 0.37 mm.

Kinkaid formation, locality 3, abundant.

This species is very similar to *B. nasuta* Morey, but differs in its concave venter and lack of the symmetrical lens-like dorsal outline.

Genus Bairdiolites Croneis and Gale

Bairdiolites brevirostris Croneis and Thurman

Plate 2, figures 15-16

Bairdiolites brevirostris Croneis and Thurman, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 326, pl. 7, fig. 20, Kinkaid formation.

Carapace ovate; overlap around entire margin, especially prominent along antero-dorsal margin; postero-dorsal slope short and straight; ventral margin straight in central portion; beak of medium length and located below median line; curved ridges low and close set, providing a broad area between the anterior rib and the end of the shell.

Length, 0.77 mm; height, 0.43 mm; thickness, 0.33 mm.

Menard formation, locality 7, common; Kinkaid formation, locality 5, abundant.

Bairdiolites bulbosus
Croneis and Bristol

Plate 2, figures 19-20

Bairdiolites bulbosus Croneis and Bristol, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 95, pl. 3, figs. 14-15, Menard formation.
Bairdiolites emarginatus Croneis and Bristol, 1939, idem., p. 96, pl. 3, figs. 12, 13, Menard formation.

Length, 0.80 mm; height, 0.47 mm; thickness, 0.31 mm.

Golconda formation, locality 17, abundant; Glen Dean formation, locality 1, rare; Vienna formation, locality 10, rare; Menard formation, locality 20, common; Clore formation, locality 26, common.

Bairdiolites crassus Cooper, n. sp.

Plate 2, figures 29-30

Carapace short and thick; greatest height almost central; overlap prominent around entire margin, venter slightly curved, dorsal margin rounded, anterior and posterior dorsal slopes fairly straight; postero-dorsal slope unusually steep (ca. 55°); anterior end rounded; beak slightly below center line; greatest height central; curved ridges, if extended, would form a very short ellipse; hinge depressed, postero-central; articulation in dorsal view slightly curved.

Length, 0.82 mm; height, 0.50 mm; thickness, 0.26 mm.

Clore formation, locality 28, abundant.

Bairdiolites fornicatus Cooper, n. sp.

Plate 2, figures 27-28

Carapace small and very short; overlap prominent except on antero- and postero-ventral slopes; in lateral view articulation above extremities forms high arch or curve, which in most species is bounded by three nearly straight lines; beak and anterior extremity very low; venter straight only in central third; dorsal articulation almost straight.

Length, 0.75 mm; height, 0.47 mm; thickness, 0.29 mm.

Menard formation, locality 15, common.

This species may be distinguished by the arch-like margin above the extremities which occupy an extremely low position.

Bairdiolites ovatus
Croneis and Funkhouser

Plate 2, figures 21-22

Bairdiolites ovatus Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 357, pl. 9, figs. 13-14, Clore formation.

Length, 0.73 mm; height, 0.46 mm; thickness, 0.35 mm.

Kinkaid formation, locality 5.

The holotype from the Clore formation has been so deeply corroded that the ribs have almost disappeared from both valves. This Kinkaid specimen, while slightly larger than the type, agrees closely in outline and general shape, the form ratio being identical.

Bairdiolites procerus Cooper, n. sp.

Plate 2, figures 39-40

Carapace ovate, rather high, with prominent overlap around entire margin; antero- and postero-dorsal slopes straight, the latter about 60°; dorsal margin of left valve arched, that of right valve almost straight, so that upper margin is bounded by three almost straight lines; lower margins curved; beak short and low, less than one-fourth of height above venter; curved ridges prominent and close-set and would, if extended to form a closed figure, result in a circle (in more elongate species the extended ridges would form ellipses); hinge depressed; surface slightly pitted.

Length, 0.80 mm; height, 0.49 mm; thickness, 0.35 mm.

Kinkaid formation, locality 6, common.

Bairdiolites tenuis Cooper, n. sp.

Plate 2, figures 37-38

Carapace very long, somewhat thin, ends pointed; centro-dorsal area flat and sides almost parallel; each end tapers to a long, thin point; overlap greatest along venter, which is almost straight, and prominent on the antero- and postero-dorsal slopes; the latter being about 40° from the horizontal;

curved ridges, if extended would form flat or elongate ellipse; hinge depressed and central; in dorsal view articulation forms almost symmetrical reverse or S curve, center of which is concave toward the right valve; beak long, almost on center line.

Length, 0.91 mm; height, 0.35 mm; thickness, 0.28 mm.

Renault formation, locality 13, common.

Bairdiolites vulgaris Cooper, n. sp.

Plate 2, figures 41-42

Carapace thick, overlap moderate around entire margin; hinge depressed, postero-central; postero-dorsal slope steep (ca. 55°); venter straight in central portion swinging upward to meet beak and anterior extremity; antero-ventral curve forms angle at each extremity, ventral articulation swinging upward resulting in concave lower margin on right valve; beak of average length, subcentral; greatest height central.

Length, 0.84 mm; height, 0.48 mm; thickness, 0.35 mm.

Paint Creek formation, locality 2, rare.

B. vulgaris may be distinguished by the concavity of the ventral margin of the right valve.

Genus Bythocypris Brady

Bythocypris amsdenensis Morey

Plate 2, figures 35-36

Bythocypris amsdenensis Morey. 1935, Jour. Paleontology, vol. 9, p. 481, pl. 54, figs. 2, 3, Amsden formation.

Carapace subovate; dorsal margin arched, venter almost straight; overlap prominent except on posterior end; greatest thickness in posterior half, tapering anteriorly.

Length, 0.48 mm; height, 0.29 mm; thickness, 0.23 mm.

Clore formation, locality 26, rare; Fayetteville shale, locality 31, abundant.

Bythocypris clorensis Croneis and Funkhouser

Plate 3, figures 1-2

Bythocypris clorensis Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 357, pl. 10, figs. 11, 12, Clore formation.

Bythocypris ulli Coryell and Johnson, 1939. Jour. Paleontology, vol. 13, p. 222, pl. 26, figs. 13a, b, Clore formation.

Length, 0.48 mm; height, 0.31 mm; thickness, 0.21 mm.

Clore formation, locality 27, common; Kinkaid formation, locality 6, rare.

Bythocypris concava Cooper, n. sp.

Plate 3 figures 3-6

Carapace elongate ovate, dorsum arched, venter concave, posterior slope straight, rising at high angle; overlap around entire margin, most prominent along anterior end and venter; hinge straight, surface smooth.

Length, 0.46 mm; height, 0.23 mm; thickness, 0.18 mm.

Vienna formation, locality 10, rare; Menard formation, locality 7, common; Kinkaid formation, locality 6, common.

B. concava, characterized by the high angle of the postero-lateral slope and the concave venter is very close to *B. cuneola* Jones and Kirkby, 1886, which however, has a straight venter.

Bythocypris fabalis Cooper, n. sp.

Plate 3, figures 29-30

Carapace large, bean-shaped, tumid; ends and dorsum rounded, venter almost straight (slightly concave); greatest height posterior, greatest thickness well above middle; greatest length near venter; middle overlap prominent; surface smooth.

Length, 1.37 mm; height, 0.90 mm; thickness, 0.60 mm.

Paint Creek formation, locality 23, depth 530-540 feet, common; Golconda formation, locality 22, rare.

Bythocypris gibba Cooper, n. sp.

Plate 3, figures 7-8

Carapace somewhat rectangular, ventral extremities angular and produced into sharp, thin edges; posterior margin almost straight and nearly vertical; dorsum broadly curved, venter distinctly concave, subparallel with dorsum; overlap prominent except on venter; greatest height and thickness central, greatest length just above venter; surface finely granulose to smooth.

Length, 0.53 mm; height, 0.25 mm; thickness, 0.21 mm.

Renault formation, locality 9, rare.

Bythocypris modica Cooper, n. sp.

Plate 3, figures 9-10

Carapace small, very ovate or subelliptical; ends and dorsum rounded, venter straight; greatest height just back of middle;

greatest length and thickness central; overlap moderately developed, varies little around the entire margin.

Length 0.42 mm; height, 0.23 mm; thickness, 0.18 mm.

Paint Creek formation, locality 24, depth 2454 feet, common.

Bythocypris opima Cooper, n. sp.

Plate 3, figures 20-21

Carapace subovate, tumid; overlap indistinct, except on ventral margin, which is slightly concave; greatest thickness slightly back of middle, greatest height above center; posterior margin almost vertical, surface smooth.

Length, 0.82 mm; height, 0.51 mm; thickness, 0.33 mm.

Golconda formation locality 22, rare.

Bythocypris ovata Cooper, n. sp.

Plate 3, figures 11-13

Carapace small, bean-shaped, smooth; ends and dorsum rounded; greatest height slightly posterior; greatest thickness central; greatest length in lower half of shell; overlap prominent, especially along dorsum.

Length, 0.69 mm; height, 0.44 mm; thickness, 0.31 mm.

Paint Creek formation, locality 21, depth 1304-1323 feet, common.

Bythocypris truncata Cooper, n. sp.

Plate 3, figures 22-28

Carapace reniform; dorsum highly arched and asymmetrical, posterior slope longer, venter straight to concave; ends rounded; greatest length well below center; greatest thickness almost central, surface sloping gradually in smooth convex curve to broad dorsum and posterior end, more rapidly to venter and anterior, giving distinctly acuminate appearance to latter margins, overlap left over right, most prominent along venter and adjacent parts of terminal margins, surface smooth.

Holotype, length, 0.98 mm; height, 0.65 mm; thickness, 0.50 mm.

Renault formation, locality 25, common.

Genus Cribroconcha Cooper, n. gen.

Seminolites (?) (in part) Harlton, 1929, Am. Jour. Sci., ser. 5, vol. 18, p. 266.—Harlton, 1933, Jour. Paleontology, vol. 7, p. 27.

Small ovate ostracodes with arched dorsum, straight to slightly convex venter; overlap, right over left around entire margin except on postero-dorsal slope where articulation is somewhat indented; anterior end curved to acuminate; posterior somewhat acuminate to rounded in lateral view; postero-lateral slope bears transverse ridge or carina more or less perpendicular to long axis of shell which may be terminated above and below in short, sharp spines, directed backward; postero-dorsal slope flattened; surface marked by numerous irregularly spaced, relatively large, round pores.

Genotype.—*C. costata* n. sp., Renault formation.

Cribroconcha is flattened antero-dorsally like *Healdia* but the latter lacks the round perforations similar to those of *Seminolites*. *Cribroconcha* lacks the anterior rib of *Seminolites* and has, instead of a curved posterior rib a straight, spine-terminated rib. Many species of *Healdia* carry the short spines at the ends of the posterior rib but all seem to lack the very definite perforations characteristic of *Cribroconcha* and *Seminolites*.

Cribroconcha costata Cooper, n. sp.

Plate 3, figures 37-42

Carapace small, ovate in lateral outline; dorsum arched, venter straight; postero-dorsal slope low, hinge line incised; postero-lateral slope interrupted by straight, vertical to slightly inclined rib terminated at each end by backward-directed spine; rib bordered by slight sinus; surface perforated by numerous round, deep pits, irregularly spaced; antero-ventral angle sharp; wedge-shaped in dorsal view; anterior end acuminate, posterior margin irregular.

Holotype, length, 0.50 mm; height, 0.30 mm; thickness, 0.23 mm.

Renault formation, locality 9, common; Paint Creek formation, localties 24 and 28, common.

This species differs from *C. perforata* (Harlton) and *C. conspicua* (Harlton) in having an arched rather than a smoothly convex dorsum, and in possessing a sharp antero-dorsal angle as compared to the rounded anterior end of the latter species. Harlton (1929, p. 266) states in his description of the above species that a faint

ridge bordered by a punctate sinus is located near the anterior end. None of the Chester specimens have even the faintest anterior ridge, but some do show an abrupt change in the curvature of the shell anteriorly, marked by a row of pits. If this is what Harlton designates as the anterior ridge, the two species referred to above belong in the genus *Cribroconcha*. In any event, the development of the posterior end is so different from the typical *Seminolites* that these species should not be included in that genus.

Cribronconcha conspicua (Harlton)

Seminolites conspicuus Harlton, 1929, Am. Jour. Sci., ser. 5, vol. 18, p. 266, pl. 2, figs. 9a-c, Fayetteville shale.

Cribroconcha fornicata Cooper, n. sp.

Plate 3, figures 34-36

Carapace ovate in lateral outline, posterior end round, dorsum arched, venter straight where prominent overlap (left over right) makes ventral margin of right valve slightly concave; anterior end truncates on ventral edge, placing greatest length well above center; greatest height central; posterior end marked by narrow, slightly curved, vertical rib, concave inward, on the inner side of which is a narrow punctate sinus; overlap moderate along anterior end and venter, less so elsewhere; postero-dorsal slope flattened, with hinge incised.

Length, 0.48 mm; height, 0.30 mm; thickness, 0.23 mm.

Paint Creek formation, locality 24, common.

Genus Healdia Roundy

Healdia aequabilis Cooper, n. sp.

Plate 3, figures 17-19

Carapace wide and thick, dorsum highly arched, with prominent posterior slope, venter broadly curved; ends rounded; posterior ribs located well back from end of shell, straight and vertical, terminating in short knob; overlap moderate around entire margin except posterior dorsal slope, which is channelled; greatest height central; greatest thickness at posterior quarter, just in front of ribs.

Length, 0.63 mm; height, 0.39 mm; thickness, 0.30 mm.

Renault formation, locality 25, common; Paint Creek formation, locality 2, common; Golconda formation, locality 19, common.

This form resembles *H. simplex* Roundy but lacks the abrupt posterior end and has a longer posterior dorsal slope, which is channelled from the apex of the dorsal arch.

Healdia caneyensis Harlton

Plate 3, figures 46-49

Healdia caneyensis Harlton, 1927, Jour. Paleontology, vol. 1, p. 208, pl. 33, figs. 2 a-c, upper Caney shale; 1929, Am. Jour. Sci., ser. 5, vol. 18, pp. 261, pl. 1, figs. 9 a-c, Springer shale; 1933, Jour. Paleontology, vol. 7, p. 26, pl. 7, fig. 10, Johns Valley shale. ——? Bradfield, 1939, Bull. Am. Paleontology, vol. 22, no. 73, p. 105, pl. 8, fig. 14, Dornick Hills formation.

Length, 0.57 mm; height, 0.35 mm; thickness, 0.27 mm.

Glen Dean formation, locality 11, abundant.

There seems to be considerable variation in the form described as *H. caneyensis*. The drawing of the dorsal view of the genotype is probably not representative, because the angularity shown is not characteristic of any known *Healdia*. However, the lateral view of this species shown later by Harlton (1929, pl. 1, fig. 9e) shows the typical dorsal outline.

Healdia cornigera (Jones and Kirkby)

Plate 3, figures 14-16

Cythere cornigera Jones and Kirkby, 1867, Ms., Geol. Soc. Glasgow, vol. 2, p. 223.——Vine, 1884, Proc. Yorkshire Geol. Polyt. Soc., n.s., vol. 8, pp. 223, 239, pl. 12, figs. 9, 9a Carboniferous of Great Britain.

Bythocypris? cornigera Jones and Kirkby, 1886, Ann. Mag. Nat. Hist., ser. 5, vol. 18, p. 251, pl. 6, figs. 8a-c, 9, Carboniferous of Great Britain.

Healdia cornigera. Latham, 1932, Trans. Roy. Soc. Edinburgh, vol. 57, pt. 2, p. 38, fig. 23, Carboniferous of Great Britain.

Waylandella cornigera. Bassler and Kellett, 1935, Geol. Soc. Am., Spec. Paper 1, p. 491.

Length, 0.50 mm; height, 0.27 mm; thickness, 0.22 mm.

Golconda formation, locality 19, rare.

This species, referred to no less than four different genera, is returned to *Healdia* because of the work of Latham, who had access to many of Jones and Kirkby's collections and to topotype collections from their localities. *Waylandella* of Coryell and Billings lacks the postero-dorsal slope of *Healdia,* which the specimen figured by Jones and Kirkby (1886, pl. 6, fig. 8a) surely has. Latham's figure of this species

also shows this slope. The Golconda form in addition to agreeing very closely with the British Carboniferous limestone specimen possesses a well-defined channel along the line of articulation on this slope.

Healdia elliptica Cooper, n. sp.

Plate 3, figures 43-45

Carapace elongate, subsymmetrical in outline; anterior end rounded; venter slightly less convex than dorsum; antero- and postero-dorsal slopes almost equal; posterior transverse ridge, located well back from end, vertical, slightly concave forward; each end terminated by knob or short spine; dorsal outline lens-shaped; greatest thickness back of middle; overlap prominent along venter and anterior margin.

Length, 0.58 mm; height, 0.33 mm; thickness, 0.25 mm.

Golconda formation, locality 19, common.

Healdia exilis Cooper, n. sp.

Plate 3, figures 52-54

Carapace ovate, high and thin; dorsum arched, postero-dorsal slope somewhat flattened; low rib curved in wide arc, its ends merging with surface of shell near apex of arched dorsum, venter near posterior quarter; overlap prominent along venter, moderate on ends; greatest height central, greatest width through posterior quarter.

Length, 0.60 mm; height 0.38 mm; thickness, 0.26 mm.

Vienna formation, locality 10, abundant.

Healdia cf. fayettevillensis Harlton

Plate 3, figures 50-51

Healdia fayettevillensis Harlton, 1929, Am. Jour. Sci., ser. 5, vol. 18, p. 263, pl. 2, figs. 2a-c, Fayetteville shale.

Length, 0.50 mm; height, 0.31 mm; thickness, 0.24 mm.

Menard formation, locality 7, rare; Clore formation, locality 4, common.

The Clore specimens seem to be somewhat longer than the Fayetteville forms, although the two specimens illustrated by Harlton vary as much as 13 per cent in form ratio. The Chester form agrees very closely in general outline and in the development of the posterior end.

Healdia menisca Cooper, n. sp.

Plate 4, figures 3-5

Carapace ovate, ends rounded, dorsum arched, venter almost straight; transverse rib, located fairly close to posterior end, strongly curved, merging into upper and lower margins in posterior quarter; greatest thickness just in front of rib in center of posterior half; greatest height almost central; articulation channelled on the postero-dorsal slope and end; surface smooth; overlap moderate along venter and antero-dorsal slope, slight on anterior end.

Length, 0.58 mm; height, 0.35 mm; thickness, 0.28 mm.

Paint Creek formation, locality 24, depth 2454-56 feet, abundant.

This species is characterized by the channelled posterior and the lack of nodes or spines. A reversal of overlap of this species would produce a form similar to *Cavellinella*. *H. menisca* does not possess the postero-dorsal shoulder of *Aurigerites*.

Healdia minuta Cooper, n. sp.

Plate 4, figures 6-7

Carapace small, short; ends rounded; dorsum slightly arched, venter convex; rib straight and inclined slightly backward; postero-dorsal slope somewhat flattened; overlap not pronounced; greatest height and thickness central.

Length, 0.48 mm; height, 0.40 mm; thickness, 0.20 mm.

Paint Creek formation, locality 24, common.

Healdia mucronata Cooper, n. sp.

Plate 4, figures 8-10

Carapace ovate, anterior end pointed, posterior bluntly rounded, dorsum and venter curved; wedge-shaped in dorsal view; transverse ridge almost straight, vertical, close to posterior end. Ends of the ridges curve back to meet dorsal and ventral margins near the posterior quarter, giving postero-dorsal area triangular aspect; articulation on postero-dorsal slope channelled; overlap not conspicuous.

Length, 0.42 mm; height, 0.27 mm; thickness, 0.22 mm.

Golconda formation, locality 19, rare.

This species may be distinguished by its pointed anterior end and by the abrupt

termination of the posterior end, particularly in the dosal view.

Healdia ornata Morey

Plate 4, figures 1-2

Healdia ornata Morey, 1935, Jour. Paleontology, vol. 9, p. 481, pl. 54, fig. 4, Amsden formation.

Healdia triangularis Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 290, pl. 6, fig. 22, Golconda formation.

Length, 0.48 mm; height, 0.31 mm; thickness, 0.21 mm.

Glen Dean formation, locality 11, common.

The Amsden and Illinois specimens agree very closely in general outline, in the development of the sharp keel-like posterior transverse ridge which is perpendicular to the venter, and in the symmetry of the dorsal arch.

Healdia ovoidea Cooper, n. sp.

Plate 4, figures 15-17

Carapace ovate, dorsum and venter curved, ends rounded; overlap conspicuous; rib straight, inclined slightly backward and curving forward at ends to merge with shell near upper and lower margins; surface smooth.

Length, 0.48 mm; height, 0.29 mm; thickness, 0.22 mm.

Renault formation, locality 9, abundant; Golconda formation, locality 19, common.

Healdia radinula Cooper, n. sp.

Plate 4, figures 18-20

Carapace elongate, anterior tapering to rounded end, dorsal and ventral margins broadly curved; rib almost straight in central portion, curving broadly to meet dorsum and sharply to meet venter; overlap moderate, surface smooth; greatest height and thickness postmedial.

Length, 0.62 mm; height, 0.35 mm; thickness, 0.30 mm.

Paint Creek formation, locality 24, common.

H. radinula is distinguished from *H. menisca* by the tapering of the anterior half of the carapace.

Healdia tenuicosta Cooper, n. sp.

Plate 4, figures 13-14

Carapace somewhat elongate, symmetrical; dorsum arched, venter slightly convex, ends equally rounded; rib thin, strongly curved, located well back from end; postero-dorsal slope flat, articulation channelled; overlap slight; greatest height central.

Length, 0.51 mm; height, 0.28 mm; thickness, 0.23 mm.

Vienna formation, locality 10, rare; Menard formation, locality 7, rare; Clore formation, locality 4, abundant; Kinkaid formation, locality 5, common.

Healdia vinitaensis Harlton

Plate 4, figures 11-12

Healdia vinitaensis Harlton, 1929, Am. Jour. Sci., ser. 5, vol. 18, p. 262, pl. 2, figs. 1a, b, Fayetteville shale.

Length, 0.60 mm; height, 0.32 mm; thickness, 0.22 mm.

Vienna formation, locality 10, common.

The Illinois and Oklahoma specimens are identical in form ratio and shape of outline. There may be some question about the agreement of the posterior ridges or nodes, due to the lack of clearness in the illustration of Harlton's specimen.

Genus Incisurella Cooper, n. gen.

Carapace thick, subovate outline; dorsal margin arched, ventral margin slightly convex; ends rounded; overlap moderate around entire margin except on postero-dorsal slope, where the articulation is a narrow, slit-like channel and the slope of this portion of the shell resembles *Healdia;* subovate shallow area just in front of posterior margin impressed into the shell, interrupting but not changing its regular curvature; overlap left over right.

Genotype.—*I. prima* n. sp.

This genus possesses many features of *Healdia* but differs in the development of the depressed area on the posterior end.

Incisurella prima Cooper, n. sp.

Plate 4, figures 27-29

Carapace thick subovate, ends rounded, dorsum arched, venter almost straight, but slightly convex; ventral margin of right valve somewhat concave; postero-dorsal slope short, articulation along hinge slit-like; overlap moderate; depression near posterior end flat, ovate slightly subcentral; surface smooth, greatest thickness and height just back of center.

Length 0.62 mm; height, 0.37 mm; thickness, 0.32 mm.

Renault formation, locality 9, abundant; Paint Creek formation, locality 24, rare.

I. prima may be distinguished from *I. lata* n. sp. by its elongate anterior end, greater relative length, and somewhat smaller ovate posterior depression.

INCISURELLA LATA Cooper, n. sp.
Plate 4, figures 21-22

Carapace short, subovate, thick, ends rounded; ventral margin slightly convex; posterior and anterior dorsal slopes almost equal, greatest height nearly central; overlap moderate on ends, greater on ventral margin; ovate depressed area, shallow, subcentral, in center of curve around posterior quarter as seen in dorsal view; depression bordered by low, very narrow rim; surface smooth.

Length, 0.60 mm; height, 0.37 mm; thickness, 0.28 mm.

Renault formation, locality 25, rare; Paint Creek formation, locality 24, common.

Genus MICROCHEILINELLA Geis
MICROCHEILINELLA CORDATA Cooper, n. sp.
Plate 4, figures 23-24

Carapace ovate, very thick, ends rounded, left valve overlaps right along venter and anterior end; posterior articulation depressed, producing decided heart-shaped outline in ventral view; hinge curved and slightly channeled; dorsum arched; venter straight; greatest thickness posterior; surface smooth.

Length, 0.45 mm; height, 0.22 mm; thickness, 0.60 mm.

Kinkaid formation, locality 3, rare.

MICROCHEILINELLA? EXILIS Cooper, n. sp.
Plate 4, figures 45-46

Carapace elongate, slender; ends rounded, posterior slightly more acute; dorsum straight, venter slightly convex; greatest length about central; greatest height and thickness back of middle; dorsal area somewhat flattened; overlap around free margin inconspicuous; hinge straight, surface smooth.

Length, 0.53 mm; height, 0.18 mm; thickness, 0.15 mm.

Renault formation, locality 9, common.

The generic affinities of this small slender form are somewhat obscure and it is being provisionally placed under *Microcheilinella* because of the flattened dorsal area and the slightly more acuminate posterior end.

MICROCHEILINELLA OBESA Cooper, n. sp.
Plate 4, figures 35-38

Carapace ovate, thick; left valve larger and thicker than right; prominent overlap around free margin; ends rounded, dorsum arched, venter straight; hinge curved, channeled; greatest length central; greatest height and thickness posterior; surface smooth.

Length, 0.58 mm; height, 0.30 mm; thickness, 0.37 mm.

Paint Creek formation, locality 21, rare; Menard formation, locality 28, depth 838-44 feet, rare; Kinkaid formation, locality 28, rare.

This species differs from *M. cordata* n. sp. in that it does not possess the indented posterior articulation which gives the latter species its heart-shaped outline. It also appears to be very close to *M. subcorbuloides* (Jones and Kirkby) and is about the same size as a form from the Barnett shale tentatively referred to the latter species by Roundy (1926, p. 8).

MICROCHEILINELLA TUMIDA Cooper, n. sp.
Plate 4, figures 47-49

Carapace ovate, tumid; ends rounded, posterior slightly more acute than anterior; venter straight; left valve larger, overlaps around entire free margins; hinge line depressed, sinuous; greatest length and height central; greatest thickness posterior; surface smooth.

Length, 0.52 mm; height, 0.25 mm; thickness, 0.28 mm.

Paint Creek formation, locality 2, rare; Golconda formation, locality 17, rare; Vienna formation, locality 36, rare; Kinkaid formation, locality 3, rare.

Genus SEMINOLITES Coryell
SEMINOLITES OVALIS Cooper, n. sp.
Plate 4, figures 32-34

Carapace ovate, almost elliptical in lateral view, ends rounded, dorsum curved, venter slightly convex; overlap pronounced along posterior and ventral margins, slight along

anterior and dorsum; posterior ridge thin, but quite high, directed backward along dorsal margin; anterior ridge indistinct, little more than slight indentation and fold in regular curvature of shell; hinge line sinuous; surface smooth.

Length, 0.60 mm; height, 0.37 mm; thickness, 0.25 mm.

Renault formation, locality 13, rare.

SEMINOLITES? REVERSUS Cooper, n. sp.
Plate 4, figures 41-42

Carapace subovate laterally, ends rounded, posterior more acute, dorsum arched; overlap right over left around entire margin, most pronounced along dorsum and venter; greatest height and length through center; greatest thickness posterior; parenthesis-like ridges at each end, subparallel to margin; anterior half higher than posterior.

Length, 0.72 mm; height, 0.47 mm; thickness, 0.33 mm.

Golconda formation, locality 17, rare.

The lateral outline of this species is almost the exact reversal of *S. compressus* Coryell and, considering the thicker end to be posterior, the overlap is also reversed. There are other notable differences however which mark *S. reversus* as a new species, namely, the marked thickening of the overlap near the mid-portions of the dorsal and ventral margins and the lack of large punctae.

SEMINOLITES SYMMETRICUS Cooper, n. sp.
Plate 4, figures 53-55

Carapace subtriangular, tumid, ends rounded, dorsum arched, venter almost straight, but slightly convex; moderate overlap around entire margin except posterior slope of dorsum, which is flattened much as in *Healdia,* articulation of this portion slightly channeled; posterior ridges thin, but prominent, subparallel to margin; anterior ridge short, low, and parallel to margin, inner side depressed into slight furrow; greatest length and height central; surface smooth.

Length, 0.55 mm; height, 0.33 mm; thickness, 0.27 mm.

Paint Creek formation, locality 2, common.

This species may be distinguished by its symmetrical lateral outline, slight overlap, and the character of the posterior ridge.

Genus MACROCYPRIS Brady

MACROCYPRIS ACUMINATA Cooper, n. sp.
Plate 4, figures 30-31

Carapace elongate, ends rounded, dorsum arched, venter straight; overlap most prominent on posterior end, anterior narrow and tapering to well rounded point; greatest thickness and height about middle of posterior half; greatest length below middle; surface smooth.

Length, 0.72 mm; height, 0.41 mm; thickness, 0.33 mm.

Menard formation, locality 30, rare.

MACROCYPRIS OVATA Cooper, n. sp.
Plate 4, figures 25-26

Carapace elongate, elliptical, ends rounded, dorsum arched, venter concave; greatest thickness near mid-length; overlap prominent along dorsum and venter only.

Length, 1.18 mm; height, 0.53 mm; thickness, 0.36 mm.

Kinkaid formation, locality 3, common.

Genus TETRATYLUS Cooper, n. gen.

Carapace ovate, ends rounded, dorsum curved, venter straight to convex, end margins of some species bordered by low ridge, terminated above and below by round, knoblike spines of variable length; valves highest anteriorly, with shallow sinus just back of center which is elongate vertically, extending from the dorsum down to about one-third of shell height, deepest near bottom; right valve overlaps left around entire margin, but overlap is inconspicuous except along venter; surface smooth to finely punctate.

Genotype—*T. ellipticus,* n. sp., Paint Creek formation.

Tetratylus differs from *Seminolites* in that the ridge, when present, is on and not back of the end margins of the shell, in the presence of four spines or knobs, and the presence of a sulcus; from *Healdia* in the presence of anterior spines and sulcus; and from *Cribrospira* n. gen. in the presence of the anterior spines and ridge, the sulcus, and the lack of circular pits.

The family classification of *Tetratylus* is somewhat uncertain because of the primitian sulcus and the cytherelloid outline.

However, because of the simple hingement and the ovate outline with arched dorsum, it is believed to be most closely allied to the Bairdiidae.

Tetratylus ellipticus Cooper, n. sp.

Plate 5, figures 1-6

Carapace with symmetrical lateral outline, elliptical, greatest height and length central; dorsal outline somewhat wedge-shaped; greatest thickness near posterior end; terminal ridges fairly prominent; spines short knob-like; sulcus shallow just back of middle; surface faintly punctate.

Length, 0.58 mm; height, 0.33 mm; thickness, 0.23 mm.

Paint Creek formation, locality 24, abundant.

This species may be distinguished from *T. menardensis* (Croneis and Bristol) by its bilaterally symmetrical outline, and from *T. elongatus* n. sp. by the lower form ratio (length over height).

Tetratylus elongatus Cooper, n. sp.

Plate 5, figure 7

Carapace elongate, ends rounded and equal; terminal ridges absent or very faint; spines short, knob-shaped; sulcus shallow, almost central; surface punctate.

Length, 0.58 mm; height, 0.28 mm.

Paint Creek formation, locality 24, rare.

Tetratylus menardensis (Croneis and Bristol)

Plate 5, figures 8-12

Healdia? menardensis Croneis and Bristol, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 98, pl. 3, fig. 28, Menard formation.

Length, 0.52 mm; height, 0.28 mm; thickness, 0.22 mm.

Paint Creek formation, locality 24, common; Menard formation, locality 28, depth 748 feet, common.

There are apparently three fairly distinct *Tetratylus* species in the Illinois Chester: (1) The bilaterally symmetrical form, *T. ellipticus;* (2) the elongate *T. elongatus,* and (3) a short, asymmetrical form, *T. menardensis.* The latter differs from species of *Healdia* in possessing a sinus, four nodes, and a reversal of overlap.

Family Beyrichiidae Ulrich

Genus Beyrichia McCoy

Beyrichia contracta Cooper, n. sp.

Plate 5, figures 13-14

Carapace elongate, thin anteriorly in lateral view; dorsum thin, expanding to wide venter. Three nodes near dorsum, the middle one wider, but not so high as anterior one; fold confined to border of ventral margin, separated from posterior node by a low saddle.

Length, 0.65 mm; height, 0.37 mm; thickness, 0.35 mm.

Golconda (basal Okaw) formation, locality 18, rare.

Differs from *B. placida* Croneis and Gale in the very narrow anterior end in the lateral view.

Beyrichia sagitta Cooper, n. sp.

Plate 5, figures 15-17

Carapace subrectangular, with distinct backward swing; free margins bordered by frilled false margin which is usually more or less completely broken away; three nodes, two located on either side of the center near the dorsum, the third at anterior end of dorsal fold which rises rapidly from posterior end, giving dorsal outline the shape of an arrow point; dorsum thin, keel-like; venter wide.

Length, 0.55 mm; height. 0.28 mm; thickness, 0.21 mm.

Paint Creek formation, locality 2, rare.

This species differs from *B. placida* Croneis and Gale in the extreme angularity of the dorsal outline.

Family Cytherellidae Sars

Genus Cavellina Coryell

Cavellina bransoni (Morey)

Plate 5, figures 22-23

Cytherella bransoni Morey, 1935, Jour. Paleontology, vol. 9, p. 482, pl. 54, fig. 5, Amsden formation.

Length, 0.75 mm; height, 0.50 mm; thickness, 0.31 mm.

Kinkaid formation, locality 3, common.

Following the ideas of Geis (1932) and Kellett (1935), this species is classified with the Carboniferous *Cavellina* rather than with the Mesozoic *Cytherella.*

Cavellina congruens Cooper, n. sp.

Plate 5, figures 20-21

Carapace elliptical, ends equally rounded; dorsum slightly more curved than venter; overlap around entire margin, greatest along the venter, resulting in trough-like furrow in mid-portion; hinge straight; sides smoothly convex, greatest thickness just back of middle; greatest length and height central.

Length, 1.10 mm; height, 0.51 mm; thickness, 0.35 mm.

Clore formation, locality 4, abundant.

This species is distinguished by its symmetry and by the unusual overlap along the venter.

Cavellina dispar Cooper, n. sp.

Plate 5, figures 28-29

Carapace subelliptical; dorsal margin slightly more arched than ventral; ends asymmetrically rounded, making greatest length above middle; overlap greatest around dorsal and posterior margins; hinge slightly sinuous; in dorsal view left valve appears much shorter than right because of offset at articulation; greatest thickness near but somewhat back of middle; greatest height central.

Length, 0.82 mm; height, 0.49 mm; thickness, 0.31 mm.

Menard formation, locality 20, common.

C. dispar may be distinguished by its peculiar overlap, and by the differences in length of the two valves.

Cavellina exila Cooper, n. sp.

Plate 5, figures 34-36

Carapace long, thin; dorsal and ventral margins almost straight, subparallel; overlap moderate; anterior end uniformly rounded; postero-ventral margin almost straight, posterior end not smoothly curved, greatest length above middle; greatest height and thickness posterior; hinge sinuous, sharply curved in middle of anterior half, produced by pronounced overlap at this point.

Length, 1.27 mm; height, 0.67 mm; thickness, 0.28 mm.

Renault formation, locality 13, rare; Vienna formation, locality 10, common; Menard formation, locality 7, common; Clore formation, locality 26, common.

Cavellina geisi (Croneis and Gale)

Plate 5, figures 43-44

Cytherella geisi Croneis and Gale, 1938, Denison Univ. Bull., Jour. Sci. Lab., vol. 33, p. 291, pl. 5, fig. 32, Golconda formation.

Length, 0.93 mm; height, 0.58 mm; thickness, 0.38 mm.

Vienna formation, locality 10, common.

This Vienna *Cavellina* agrees closely with the figure and description of the Golconda form of Croneis and Gale. In addition this specimen shows, in dorsal view, a somewhat sinuous hinge line and the internal ridge in the posterior quarter is suggested by a faint interruption of the regular convexity of the valves at this point.

Cavellina glandella (Whitfield)

Plate 5, figures 49-50

Cytherellina glandella Whitfield, 1882, Am. Mus. Nat. Hist., Bull. 3, vol. 1, p. 54, pl. 9, figs. 28, 29, Spergen limestone.——Hall, 1882, Indiana Dept. Geol. Nat. Res., 12th Ann. Rept., pl. 32, figs. 28, 29, Spergen limestone.——Cummings and Beede, 1905, ibid., 30th Ann. Rept., pl. 26, figs. 28, 29, Spergen limestone.

Cytherella glandella. Girty, 1915, U. S. Geol. Survey, Bull. 593, p. 136, Batesville sandstone.

Cavellina glandella. Geis, 1932, Jour. Paleontology, vol. 6, p. 186, pl. 26, figs. 9a-d, Salem limestone.

Length, 1.0 mm; height, 0.60 mm; thickness, 0.29 mm.

Kinkaid formation, locality 3, common.

These Chester specimens, although smaller than those described from the Salem, appear to be identical in form ratio and other structural features.

Cavellina librata Cooper, n. sp.

Plate 5, figures 37-38

Carapace subelliptical; dorsum rounded or broadly arched, venter straight; overlap around entire margin, most pronounced on dorsum; in dorsal view posterior end bounded by almost straight sides, giving somewhat pointed appearance; anterior end sharply rounded; hinge almost straight.

Length, 0.78 mm; height, 0.45 mm; thickness, 0.29 mm.

Clore formation, locality 4, common.

Cavellina longula Cooper, n. sp.

Plate 5, figures 41-42

Carapace elongate; dorsum arched, venter almost straight; left valve considerably

smaller than right due to prominent overlap; posterior end asymmetrically rounded, due to flattening of curvature of postero-ventral portion of left valve; greatest length above middle; antero-ventral margin of left valve slightly upturned; in dorsal view hinge line sinuous, offset at articulation prominent; greatest thickness posterior; greatest height central.

Length, 0.98 mm; height, 0.62 mm; thickness, 0.42 mm.

Golconda formation, locality 22, rare.

Cavellina ovatiformis (Ulrich)

Plate 5, figures 45-48

Cytherella ovatiformis Ulrich, 1891, Jour. Cincinnati Soc. Nat. Hist., vol. 13, p. 209, pl. 17, figs. 3, 4a-c, Chester series.——Batalina, 1924, Bull. Com. Geol., vol. 43, no. 10, pp. 1324, 1335, pl. 22, fig. 7, pl. 23, figs. 12-14, Lower Carboniferous of Russia.

Cavellina mediocris Croneis and Thurman, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 327, pl. 7, fig. 17, Kinkaid formation.

Cavellina ovalis Croneis and Funkhouser, idem. p. 358, pl. 10, figs. 9, 10, Clore formation.

Length, 1.03 mm; height, 0.69 mm; thickness, 0.49 mm.

Paint Creek formation, locality 24, abundant; Vienna formation, locality 10, common; Menard formation, locality 32, rare; Kinkaid formation, locality 5, common; Fayetteville shale, locality 31, abundant.

Cavellina parva Cooper, n. sp.

Plate 5, figures 39-40

Carapace small, subelliptical, smooth; overlap greatest on dorsum and venter; posterior end slightly less regularly curved than anterior; greatest length slightly above center; greatest height slightly forward of center, greatest thickness back of center; posterior end somewhat upturned; hinge line sinuous, due to increase of overlap in anterior half.

Length, 0.78 mm; height, 0.49 mm; thickness, 0.33 mm.

Vienna formation, locality 10, common.

The position of the greatest height, just forward of the middle, serves to distinguish this species which is somewhat intermediate between *Cavellina* and *Paracavellina;* however, it does not possess the posterior ridge of the latter genus.

Genus Paracavellina Cooper, n. gen.

Carapace cytherelloid in outline; overlap right over left around entire margin; dorsal and ventral margins arched to form greater overlap at these points; curvature of valves interrupted at each end by ridge close to and parallel with margins resulting in furrow just inside the ridge; surface smooth to granulose or minutely pitted.

Genotype.—*P. elliptica* n. sp.

This genus is distinguished from *Cavellina* by the ventral arch and terminal ridges; from *Birdsallella* and *Cavellinella* by the presence of the anterior ridge and the location of the posterior ridge much closer to the margin.

Paracavellina elliptica Cooper, n. sp.

Plate 6, figures 5-6

Carapace elliptical, like *Cavellina* in outline, greatest height and length central; overlap around entire margin; regular convexity of right valve interrupted at each end by abrupt swelling, forming more or less prominent ridge parallel to terminal margins; ridge extends farther around venter than around dorsum, matched on the left valve by a slight swelling that is much less noticeable on the right valve; width of left valve increased by regular increase in amount of overlap from each end toward center; greatest thickness in posterior quarter.

Length, 1.06 mm; height, 0.67 mm; thickness, 0.48 mm.

Golconda formation, locality 17, rare.

Paracavellina opima Cooper, n. sp.

Plate 6, figures 34-35

Carapace short, ovate, tumid; terminal ridges somewhat prominent; ends broadly curved; dorsum arched, venter almost straight; greatest overlap along venter; hinge straight; greatest length and height central; greatest thickness posterior; surface smooth.

Length, 0.68 mm; height, 0.49 mm; thickness, 0.33 mm.

Paint Creek formation locality 24, rare.

Paracavellina ovata Cooper, n. sp.

Plate 6, figures 3-4

Carapace ovate; dorsum strongly arched, venter almost straight; terminal ridges low,

somewhat indistinct; greatest height and thickness just back of center, greatest length central; hinge straight.

Length, 0.76 mm; height, 0.55 mm; thickness, 0.38 mm.

Menard formation, locality 15, rare.

P. ovata resembles *P. opima* n. sp. from the Paint Creek, but is larger, not so abruptly terminated anteriorly, and has its greatest thickness more nearly central.

Paracavellina pinguis Cooper, n. sp.

Plate 6, figures 7-8

Carapace short, thick; outline subelliptical in lateral view; ventral margin almost straight, dorsum arched; anterior ridge more prominent than posterior; surface smooth.

Length, 0.95 mm; height, 0.62 mm; thickness, 0.47 mm.

Golconda formation, locality 17, common.

P. pinguis may be distinguished from the genotype by the shorter, thicker carapace and by the relatively greater width across the anterior and posterior ends in lateral view.

Paracavellina tumida Cooper, n. sp.

Plate 6, figures 17-18

Carapace ovate, tumid; right valve much thicker than left; greatest thickness posterior; terminal ridges only slightly developed, posterior one quite indistinct; hinge irregular or sinuous; dorsum arched, venter less so; overlap greatest along venter; greatest thickness and height just back of middle, greatest length central; surface smooth to pitted just inside terminal ridges.

Length, 0.74 mm; height, 0.50 mm; thickness, 0.39 mm.

Paint Creek formation, locality 24, common.

Genus Platychilus Cooper, n. gen.

Carapace cytherelloid in outline; ends rounded, overlap inconspicuous at these points; dorsum and venter strongly arched, overlap very prominent; valves regularly convex or with a broad shallow depression near mid-dorsal area; hingement cardine[3]; surface smooth.

[3]The "tongue and groove" articulation at the hinge, common in so many ostracodes, is, unfortunately, often described as denticulation. Since the "tongue" does not possess the usual shape of a denticle or tooth, it is proposed to use the word "cardine" (L. **cardinis**, a pivot and socket on which the doors of the ancients revolved, or in building, a tenon and mortise) for this type of ostracode hingement.

Genotype.—*Platychilus ovoides* n. sp., Vienna formation.

Platychilus resembles *Cavellina* somewhat closely but may be readily distinguished from it by the unusual development of the overlap along the midportions of the dorsal and ventral margins, especially by the latter. It also lacks the post-ventral truncation common in *Cavellina*.

Platychilus ovoides Cooper, n. sp.

Plate 6, figures 26-27

Carapace cytherelloid in outline; ends about equally rounded; upper and lower margins of left valve slightly convex, subparallel; right valve strongly convex, resulting in very marked increase in overlap near mid-portion of the dorsum and venter; overlap greatest just back of middle on dorsum, just in front of middle on venter; overlap on ends inconspicuous; greatest thickness just back of, and above center; both valves have pinched or broadly depressed area in front of point of greatest tumidity, greatest at dorsum, disappearing about mid-height; hinge straight, occupies anterior two-thirds of dorsal articulation; surface smooth.

Length, 0.63 mm; height, 0.43 mm; thickness, 0.26 mm.

Vienna formation, locality 10, common.

Genus Sargentina Coryell and Johnson

Sargentina allani Coryell and Johnson

Plate 6, figures 19-22

Sargentina allani Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 223, pl. 25, figs. 9a-c, Clore formation.

Sargentina forsetii Coryell and Johnson, idem. p. 224, pl. 25, figs. 10a, b, Clore formation.

Male: length 0.91 mm; height, 0.61 mm; thickness, 0.39 mm.

Female: length, 0.95 mm; height, 0.62 mm; thickness, 0.49 mm.

Clore formation, locality 27, common.

These two species are similar in every respect except thickness. Because the greater thickness of the posterior portion of the shell has been considered a character that distinguishes female individuals, these two forms are believed to be the two sexes of the same species.

The figured specimens are topotypes, figure 19 clearly showing the obesity of

the female as contrasted with the male (fig. 21), while the lateral views (figs. 20 and 22) are indistinguishable one from the other.

SARGENTINA ASULCATA Cooper, n. sp.
Plate 6, figures 1-2

Carapace subelliptical, tumid; surface smooth; overlap prominent around entire margin; ends almost equally curved except for slight backward swing; greatest thickness slightly in front of middle, greatest length and height through center; right valve has broad, somewhat flat area in postero-dorsal region, beginning just below hinge; hinge line straight, meeting posterior margin at an angle with pronounced overlap of right valve.

Length, 0.89 mm; height, 0.62 mm; thickness, 0.45 mm.

Kinkaid formation, locality 5, rare.

S. asulcata differs from all other species in the lack of a prominent sulcus, in lieu of which is found the flattened area in the mid-dorsal portion of the left valve.

SARGENTINA CRASSIMARGINATA
(Croneis and Thurman)
Plate 6, figures 9-10

Sulcella crassimarginata Croneis and Thurman, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 328, pl. 7, figs. 15, 16, Kinkaid formation.

Carapace subelliptical in lateral outline; right valve overlaps prominently around entire margin, especially along dorsum and venter; dorsal margin of left valve straight, lateral outline with forward swing; sulcus deep, forward of center; hinge straight, notched at ends; surface smooth.

Length, 0.73 mm; height, 0.51 mm; thickness, 0.33 mm.

Kinkaid formation, locality 5, rare.

This form lacks the lateral configuration and type of overlap of *Sulcella* and also possesses a deeper sulcus than is present in the latter genus.

Genus SULCELLA Coryell and Sample
SULCELLA CELSA Cooper, n. sp.
Plate 6, figures 15-16

Carapace ovate, ends high and rounded, dorsum and venter curved; sulcus and terminal ridges indistinct; hinge line curved; overlap greatest along dorsum and venter; surface smooth.

Length, 0.73 mm; height, 0.44 mm; thickness, 0.40 mm.

Paint Creek formation, locality 24, depth 2454 feet, common.

S. celsa is differentiated from *S. ovata* n. sp. by its low form ratio, 1.65 as compared to 1.8.

SULCELLA NODOCOSTA Cooper, n. sp.
Plate 6, figures 13-14

Carapace ovate, ends round; dorsum curved, venter almost straight; overlap moderate on dorsum and venter, inconspicuous on ends; sulcus very indistinct, wide, shallow; anterior ridge low, parallel to margin; posterior ridge more prominent, higher at ends than in middle, giving somewhat knob-like appearance, especially in the dorsal view; hinge slightly sinuous; surface smooth.

Length, 0.58 mm; height, 0.35 mm; thickness, 0.22 mm.

Paint Creek formation, locality 24, depth 2454 feet, common.

This species may be distinguished from *S. ovata* n. sp. by the raised and abruptly terminated posterior costae.

SULCELLA OVATA Cooper, n. sp.
Plate 6, figures 11-12

Carapace ovate; venter straight, dorsum curved; ends rounded; overlap most prominent on dorsum and venter; sulcus central, wide, very shallow; terminal ridges quite inconspicuous; hinge line curved; greatest thickness in center of posterior half; surface smooth.

Length, 0.72 mm; height, 0.42 mm; thickness, 0.29 mm.

Paint Creek formation, locality 24, depth 2454 feet, common.

Family DREPANELLIDAE Swartz
Genus CORNIGELLA Warthin
CORNIGELLA GOLCONDENSIS
(Croneis and Gale)
Plate 6, figures 36-37

Verrucosella golcondensis Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 275, pl. 5, fig. 8, Golconda formation.—— Croneis and Bristol, 1939, ibid., vol. 34, p. 85, pl. 4, fig. 6, Menard formation.

Length, 0.67 mm; height, 0.36 mm; thickness, 0.27 mm.

Paint Creek formation, locality 2, rare; Vienna formation, locality 10, rare; Menard formation, locality 28, common.

Pennsylvanian species found in both Illinois and the mid-Continent area show that the genus *Cornigella* is quite variable. The Chester species, illustrated here by an adult from the Paint Creek is known also from the Golconda, Vienna and Menard formations. The mature specimen is almost indistinguishable from many elongate, short-spined species occurring abundantly in samples yielding many specimens of the Pennsylvanian *C. minuta — C. longispina* type. The only known differentiation is by means of the large form ratio (1.87) of the Chester series.

Family Glyptopleuridae Girty
Genus Glyptopleura Girty
Glyptopleura alata
Croneis and Funkhouser

Plate 6, figures 45-47

Glyptopleura alata Cronies and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 349, pl. 10, fig. 3, Clore formation.
Glyptopleura skathiae Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 217, pl. 25. fig. 4, Clore formation.

Length, 0.95 mm; height, 0.59 mm; thickness, 0.40 mm.

Clore formation, locality 26, common.

This common Clore species is characterized by its almost horizontal ribs and by its short ovate outline.

Glyptopleura alvea Cooper, n. sp.

Plate 6, figures 31-33

Carapace ovate, hinge long, straight; dorsum trough-like, very broad; three fairly prominent ribs, central one traversing an elongate pit; less distinct ribs occur between more prominent ones, one above and two below pit; dorsal angles sharp.

Length, 1.13 mm; height, 0.71 mm; thickness, 0.55 mm.

Kinkaid formation, locality 5, rare.

Glyptopleura bristoli
Croneis and Gutke

Plate 6, figure 38

Glyptopleura bristoli Croneis and Gutke, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 49, pl. 2, figs. 3, 4, Clore formation.
Glyptopleura pergibba Croneis and Gutke, 1939, idem., p. 53, pl. 2, figs. 1, 2, Clore formation.

Length, 0.96 mm; height, 0.55 mm.

Renault formation, locality 25, rare; Paint Creek formation, locality 2, rare.

Glyptopleura circumcostata
Cooper, n. sp.

Pate 7, figures 1-3

Carapace large, elongate, ends rounded; hinge straight; posterior dorsal angle sharp; hinge depressed, with notched overlap at each end; ribs form triple U nested one inside the other, joined at the base; two additional unjoined ribs inside inner U and below pit; cardinal area broad, shallowly V-shaped where hinge is slightly depressed.

Length, 1.06 mm; height, 0.64 mm; thickness, 0.54 mm.

Kinkaid formation, locality 3, common.

Glyptopleura complexa
Croneis and Bristol

Plate 7, figure 32

Glyptopleura comlexa Croneis and Bristol, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 87, pl. 4, fig. 25, Menard formation.
Glyptopleura hamatilis Croneis and Bristol, 1939, idem., p. 88, pl. 4, fig. 22, Menard formation.

Length, 0.71 mm; height, 0.42 mm.

Vienna formation, locality 10, rare; Menard formation, locality 28, depth 746-49 feet, common; Clore formation, locality 28, rare; Kinkaid formation, locality 5, rare.

Glyptopleura elongata Cooper, n. sp.

Plate 7, figure 42

Carapace long, about symmetrical in outline, ends rounded, hinge straight, short compared to total length; four ribs implanted in broad U, second from dorsum interrupted by pit; linear dimension greatly increased by comparative elongation of posterior end, observable by comparison with the posterior dorsal angle; hinge only slightly more than half total length of shell.

Length, 1.14 mm; height, 0.53 mm.

Clore formation, locality 26, rare.

Glyptopleura henbesti
Croneis and Gutke

Plate 7, figure 9-11

Glyptopleura henbesti Croneis and Gutke, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 51, pl. 2, figs. 7, 8, Renault formation.
Glyptopleura hendricksi Croneis and Gutke, 1939, idem., p. 52, pl. 2, figs. 5, 6, Renault formation.

Length, 0.89 mm; height, 0.50 mm; thickness, 0.49 mm.

Renault formation, locality 9, common.

Glyptopleura inoptina Girty

Plate 7, figures 20-22

Glyptopleura inoptina Girty, 1910, Ann. New York Acad. Sci., vol. 20, p. 236, Fayetteville shale.——Roth, 1929, Pub. Wagner Free Inst. Sci., vol. 1, pp. 7, 35, 36.——Coryell and Brockmier, 1931, Am. Midland Nat., vol. 12, p. 509.

Carapace subquadrate ends rounded; dorsum straight, venter slightly convex; overlap very prominent around free margins; hinge slightly channeled, terminated posteriorly by well developed lip which overlaps margin; cardinal extremities angular, ventral extremities curved; pit slight above and back of center; costae prominent, regular, oblique; rib bends sharply upward around pit, coalescing with the rib next above rather than being broken by pit as in most other species.

Length, 1.34 mm; height, 0.83 mm; thickness, 0.47 mm.

Clore formation, locality 26, rare.

This form, common in the Fayetteville shale and Pitkin limestone of Arkansas, is characteried by the union of the two ribs immediately above the pit. This form is thought to be identical with the form described but not figured by Girty (1910) from the Arkansas formation. *G. costata* (McCoy) also resembles this form in the rib arrangement but is shorter and lacks the rounded anterior margin of *G. inoptina*.

Glyptopleura kellettae Croneis and Thurman

Plate 7, figure 12

Glyptopleura kellettae Croneis and Thurman, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 319, pl. 7, fig. 8, Kinkaid formation.

Length, 0.84 mm; height, 0.42 mm.

Clore formation, locality 26, rare; Kinkaid formation, locality 10, common.

This specimen is somewhat less rounded on the posterior end than the holotype, but the rib pattern is similar. The original figure of the holotype shows an over accentuation of the ribs because of a heavy coat of ammonium chloride.

Glyptopleura multicostata Morey

Plate 7, figures 33-34

Glyptopleura multicostata Morey, 1935, Jour. Paleontology, vol. 9, p. 477, pl. 54, fig. 9, Amsden formation.

Glyptopleura valkyriae Coryell and Johnson, 1939, Jour. Palentology, vol. 13, p. 218, pl. 25, fig. 6, Clore formation.

Length, 1.05 mm; height, 0.67 mm; thickness, 0.44 mm.

Clore formation, locality 27, rare.

This Clore form, although a little higher than the one described by Morey, appears very close to that species, especially in the arrangement of the surface markings.

Glyptopleura spinosa (Jones and Kirkby)

Plate 7, figures 17-19

Kirkbya spinosa Jones and Kirkby, 1885, Ann. Mag. Nat. Hist., ser. 5, vol. 15, p. 185, pl. 3, fig. 12, Lower Carboniferous of Great Britain.

Glyptopleura spinosa. Coryell and Brackmier, 1931, Am. Midland Nat. vol. 12, p. 513, pl. 2, fig. 10.——Latham, 1932, Trans. Roy. Soc. Edinburgh, vol. 72, pt. 2, p. 732, fig. 20, Lower Carboniferous of Great Britain.

Carapace small, short, retral swing prominent; ribs form single inclined loop or U across shell, upper side crossing deep elongate pit and terminating in antero-dorsal quarter in sharp elongate, spine-like node; surface reticulate; greatest thickness and height anterior; overlap slight.

Length, 0.48 mm; height, 0.29 mm; thickness, 0.25 mm.

Menard formation, locality 20, rare.

The lateral view of this form resembles *G. parvacostata* Geis, but lacks the prominent overlap of the Salem species.

Glyptopleura symmetrica Croneis and Funkhouser

Plate 8, figures 12-14

Glyptopleura symmetrica Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 353, pl. 10, fig. 1, Clore formation.

Glyptopleura nerthusae Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 217, pl. 25, figs. 5a, b, Clore formation.

Length, 1.02 mm; height, 0.59 mm; thickness, 0.53 mm.

Kinkaid formation, locality 5, common; Clore formation, locality 26, rare.

Glyptopleura tyri (Coryell and Johnson)

Plate 8, figures 10-11

Glyptopleurites tyri Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 219, pl. 26, figs. 10a-c, Clore formation.

Length, 0.67 mm; height, 0.35 mm; thickness, 0.29 mm.

Clore formation, locality 27, rare.

Glyptopleura varians Croneis and Funkhouser

Plate 8, figures 15-17

Glyptopleura varians Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 355, pl. 10, figs. 5, 6, Clore formation.

Glyptopleura freyjae Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 219, pl. 26, fig. 17, Clore formation.

Ceratopleurina mimiri? Coryell and Johnson, 1939, idem., p. 221, pl. 26, figs. 9a, b, Clore formation.

Length, 0.78 mm; height, 0.46 mm; thickness, 0.33 mm.

Menard formation, locality 20, rare; Clore formation, locality 27, rare; Kinkaid formation, locality 3, common.

Glyptopleura venosa (Ulrich)

Plate 8, figures 19-21

Kirkbya venosa Ulrich, 1891, Jour. Cincinnati Soc. Nat. Hist., vol. 13, p. 208, pl. 18, figs. 3a, b, Glen Dean formation.

Glyptopleura venosa. Coryell and Brackmier, 1931, Am. Midland Nat., vol. 12, p. 516, pl. 2, fig. 5.

Carapace ovate, nearly symmetrical, greatest height slightly in front of center; hinge straight; ribs irregularly curved, anastomosing; surface reticulate; border of free margins flat to slightly depressed; greatest thickness anterior.

Length, 0.89 mm; height, 0.53 mm; thickness, 0.53 mm.

Kinkaid formation, locality 3, common.

This Kinkaid form is identical with that described by Ulrich from the Glen Dean of Kentucky in shape, markings, and size; the latter is erroneously stated in the original description, but Ulrich's figure shows that the holotype is almost exactly the same size as the Kinkaid specimen.

Genus Glyptopleurina Coryell

Glyptopleurina Coryell, 1928, Jour. Paleontology, vol. 2, p. 381.

Idiomorphina Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 284.

Coryell differentiated *Glyptopleurina* from other Glyptopleuridae by the presence of nodes and flange in addition to the inosculating costae. The subsequent descriptions of several species from the Chester have shown that the flange is an extremely variable character, in some species being almost inconspicuous around the entire free margin, and well developed only at the ends of the carapace.

Idiomorphina was described as being more bulbous posteriorly than *Glyptopleurina* and as possessing a split anterior lobe. However, in their description of *G. bulbosa,* Croneis and Gale list the split lobe as a specific character. The genotype *I. insignis* is a single right valve and since the marginal development of *Glyptopleurina* is somewhat variable, this feature therefore is of doubtful generic value. It is suggested that the three described species of *Idiomorphina* are all females, which would explain the obesity of the posterior end.

Some species of *Glyptopleurina* bear a general resemblance to *Geffenina* and *Geffenites,* except that the latter genera do not possess the curved rib joining the dorsal nodes, nor is the marginal lobe so sharply defined as in *Glyptopleurina.* The orientation of this family has been reversed to conform to more recent ideas concerning ostracode orientation, which makes the right valve the larger and the overlapping one. This puts the position of the greatest thickness and ventral truncation posterior, and the obtuse cardinal angle anterior (Geis, 1932, pp. 150-155).

Glyptopleurina flexuosa Cooper, n. sp.

Plate 8, figures 25-27

Carapace large, elongate, ovate, hinge straight, ends rounded; venter slightly convex, wedge-shaped in dorsal view; node slightly elongate vertically; ventral margin joined to narrow rib which turns abruptly upward and across shell where it joins anterior inflation about midway between dorsum and venter; rib distinctly concave downward; hinge straight, channelled, with distinct notch at posterior end; marginal ridge broad and close to ventral and posterior margins, merging into inflation on opposite end.

Length, 0.71 mm; height, 0.47 mm; thickness, 0.44 mm.

Paint Creek formation, locality 2, rare.

This species resembles *G. bulbosa* Croneis and Gale, but lacks the separation of the rib from the anterior lobe, and the decided curvature. The marginal ridge is also farther from the edge of the shell than in that species.

Glyptopleurina iniqua Cooper, n. sp.

Plate 8, figures 7-8

Carapace large, dorsum straight, venter broadly curved; ends rounded, highest anteriorly, posterior end thickest; node joined to posterior swelling by prominent rib which is concave downward; marginal flange prominent only on anterior end; surface reticulate; hinge straight.

Length, 0.87 mm; height, 0.51 mm; thickness, 0.42 mm.

Vienna formation, locality 10, common.

This species is distinguished by the very unequal height of the two ends and by the extreme obesity of the posterior end.

Glyptopleurina insculpta (Croneis and Funkhouser)

Plate 8, figures 53-54

Jonesina insculpta Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 342, pl. 10, figs. 21, 22, Clore formation.

Length, 0.88 mm; height, 0.53 mm; thickness, 0.42 mm.

Clore formation, locality 26, rare; Kinkaid formation, locality 5, common.

The Kinkaid specimen is slightly more tumid than the holotype, but is in close agreement with the paratypes, which show the faint ridge subparallel to the anteroventral portion of the free margin.

Glyptopleurina insignis (Croneis and Gale)

Idiomorphina insignis Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 284, pl. 6, fig. 4, Golconda formation.

Glyptopleurina longuronis Cooper, n. sp.

Plate 8, figures 50-52

Carapace elongate; dorsum straight, venter broadly curved; anterior node ovate, lower side joined to narrow rib which turns abruptly backward, ending in spine-like knob; marginal lobe marked with narrow carina, curving up and around node; sinus small but deep; ends rounded and greatly produced, making total length much greater than length of hinge; flat marginal flange prominent only on ends; hinge impressed into cardinal area as straight narrow groove; portion of frill preserved anteriorly; surface reticulate; greatest thickness central.

Length, 0.73 mm; height, 0.40 mm; thickness, 0.34 mm.

Renault formation, locality 9, rare.

This form, in contrast to *G. bulbosa* Croneis and Gale and *G. flexuosa* n. sp., is thickest in the central portion, suggesting that it is either a male or non-fertile female, and that the wedge-shaped forms with the greatest thickness quite close to the posterior end are fertile females. This difference is discernible only in the dorsal view.

Glyptopleurina oehersi (Croneis and Bristol)

Plate 8, figure 9

Idiomorphina oehersi Croneis and Bristol, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 94, pl. 4, fig. 17, Menard formation.

Length, 0.89 mm; height, 0.48 mm.

Golconda formation, locality 22, rare; Vienna formation, locality 36, common; Menard formation, locality 28, depth 746-749 feet, common.

Glyptopleurina ornata (Croneis and Gale)

Plate 8, figures 35-37

Idiomorphina ornata Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 285, pl. 6, figs. 1, 2, Golconda formation.

Length, 0.77 mm; height, 0.44 mm; thickness, 0.41 mm.

Golconda formation, locality 19, rare; Glen Dean formation, locality 11, rare.

Glyptopleurina simulatrix (Ulrich)

Plate 8, figures 38-41

Beyrichia simulatrix Ulrich, 1891, Jour. Cincinnati Soc. Nat. Hist., vol. 13, p. 205, pl. 18, figs. 7a, b, Chester series.

Hollinella simulatrix. Bassler and Kellett, 1935, Geol. Soc. Am. Spec. Paper 1, p. 335.

Carapace elongate, ovate ends rounded, hinge straight; nodes just below dorsum connected by curved, narrow rib-like ridge; ridge bordered below and on posterior end by wider, hook-shaped ridge, broadest anteriorly, gradually tapering and ending

just back of posterior node; hinge depressed, notched at ends; surface reticulate.

Length, 0.74 mm; height, 0.45 mm; thickness, 0.33 mm.

Paint Creek formation, locality 2, rare; Golconda formation, locality 28, depth 1134-74 feet, rare.

GLYPTOPLEURINA VETULA Cooper, n. sp.

Plate 8, figures 44-46

Carapace large, elongate, dorsum straight, ends curved, venter complex; retral swing fairly prominent; medium sinus deep, anterior one shorter, more shallow; lobe connected to anterior inflation by low curved costa subparallel to another which curves around front of lobe; overlap prominent around free margins; hinge channeled, overlapped at ends; surface granulose; frill, if ever present, completely broken away; greatest thickness near anterior end; greatest height through lobe.

Length, 0.30 mm; height, 0.49 mm; thickness, 0.48 mm.

Golconda formation, locality 19, rare.

This species, like others from the Chester, lacks the posterior lobe possessed by many congeneric forms. It is probable that the great inflation of the posterior end has precluded the development of this node, suggesting that these forms are females.

Genus MESOGLYPHA Cooper, n. gen.

Shell large, ovate in lateral outline, strongly convex, right valve much larger than left, overlapping along free margins, extending above dorsal margin; surface sculpture centered about small but deep pit just in front of and slightly above center of shell, consists of rather indistinct, broad, subhorizontal costae covering about fifty per cent of shell surface; hinge line straight, slightly channeled, terminated at each end by flap overlapping the left valve; hingement cardine, free margins frilled.

Genotype.—*M. mediocre* n. sp., Glen Dean formation.

Mesoglypha is similar to *Glyptopleura* Girty but lacks the prominent ridges marking the entire shell surface, is less quadrate in lateral outline. No species of *Glyptopleura* are known to be frilled. *Sargentina* does not possess the same hinge structure, nor a pit (it has a sulcus) and it lacks the transverse costae.

MESOGLYPHA MEDIOCRE Cooper, n. sp.

Plate 8, figures 47-49

Carapace tumid, ovate in lateral outline, ends rounded; dorsum and venter convex; right valve much larger than left, overlapping around entire free margins, rising above hinge on dorsal margin; postero-dorsal angle truncated; forward swing moderate; hinge straight, cardine, terminated at each end by large flap overlaping left valve at cardinal angles; surface smooth, except around pit, which area is marked by low, broad, somewhat indistinct subhorizontal costae; pit just in front of center, quite deep although of small diameter; greatest thickness in posterior quarter; greatest height in anterior quarter; remnant of a frill apparently present at antero-ventral corner.

Length, 0.93 mm; height, 0.59 mm; thickness, 0.49 mm.

Glen Dean formation, locality 11, common.

Genus VENULA Cooper, n. gen.

Glyptopleuridae with faint anastomosing costae, subquadrate outline, characteristic *Glyptopleura* hingement; right valve larger, overlapping around free margin; pit small, circular, almost midway between ends and slightly above midheight.

Genotype.—*Primitiopsis? striatus* Croneis and Funkhouser.

Venula has somewhat the same outline as *Primitiopsis* (Jones) but lacks the reticulate surface, ventral swelling, the strong convexity, and the terminal flanges of the older genus.

VENULA STRIATA
(Croneis and Funkhouser)

Plate 9, figures 26-27

Primitiopsis? striatus Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 340, pl. 10, fig. 13, Clore formation.

Carapace subquadrate, dorsum and venter straight, parallel; anterior end rounded, posterior almost straight and vertical, giving forward swing; in dorsal view distinctly wedge-shaped, sides straight or very slightly convex; hinge line straight, somewhat san-

sabelloid with overlapping notch at each end, channeled in posterior half; pit circular, slightly forward, above center; surface marked with numerous faint anastomosing or vein-like costae.

Length, 0.72 mm; height, 0.39 mm; thickness, 0.29 mm.

Kinkaid formation, locality 28, depth 628-33 feet, rare.

This form does not possess the downward shell slope parallel to the posterior margin of the Clore specimen, although it seems to conform in most other respects.

Family GRAPHIADACTYLLIDAE Kellett

Genus GRAPHIADACTYLLIS Roth

GRAPHIADACTYLLIS ARKANSANA (Girty)

Plate 9, figures 9-12

Kirkbya lindahli var. *arkansana* Girty, 1910, Ann. New York Acad. Sci., vol. 20, no. 3, pt. 2, p. 234, (no figs.), Fayetteville shale. ——Roundy, 1926, U. S. Geol. Survey, Prof. Paper 146, p. 7, figs. 15-16, Barnett shale.

Graphiodactylus arkansanus. Kellett, 1936, Jour. Paleontology, vol. 10, pp. 773-775.

Length, 1.31 mm; height, 0.70 mm; thickness, 0.60 mm.

Fayetteville shale, locality 34, abundant.

The genotype (figs. 10-12) shows the lack of the anterior spur, the short reticulae, the position of the pit just anterior to mid-length, and the development of a number of small spines on the anterior end. Figure 9, the interior of a right valve, shows the hinge line, the pitted muscle spot, and the articulation along the free margins.

GRAPHIADACTYLLIS TENUIS Cooper, n. sp.

Plate 9, figures 7-8

Bassleria fayettevillensis Harlton, 1929, Am. Jour. Sci., ser. 5, vol. 18, p. 256, pl. 1, figs. 2a-c, Fayetteville shale.

Kirkbya lindahli var. *arkansana* (part). Roundy, 1926, U. S. Geol. Survey, Prof. Paper 146, p. 7, pl. 1, figs. 14a-c, Barnett shale.

Carapace subrhomboid, narrowing (in lateral view) perceptibly toward posterior end; dorsum straight, hinge slightly channelled; overlap most prominent around ends and venter; surface bears long straight to curved reticulae; anterior spine-like projection moderately developed; a short and narrow but prominent posterior spine rises abruptly from antero-dorsal corner; pit or muscle scar just back of mid-length; greatest thickness posterior.

Length, 1.12 mm; height, 0.63 mm; thickness, 0.50 mm.

Fayetteville shale, locality 33, common.

This species differs from the genotype *G. arkansana* (Girty) in having more elongate reticulae, a prominent posterior spine, and an anterior spur, and the pit located just behind, instead of in front of mid-length.

Family HOLLINELLIDAE Swartz

Genus HOLLINELLA Coryell

HOLLINELLA GRANIFERA (Ulrich)

Plate 9, figure 45

Bollia granifera Ulrich, 1891, Jour. Cincinnati Soc. Nat. Hist., vol. 13, p. 205, pl. 12, figs. 12a, b, Spergen limestone.——Batalina, 1924, Com. Geol., Bull. 43, no. 10, p. 1325, pl. 22, figs. 9-12, pl. 23, figs. 18-22.

Hollina granifera. Ulrich and Bassler, 1908, Proc. U. S. Nat. Mus., vol. 35, p. 315, pl. 42, figs. 16, 17.

Hollinella granifera. Bassler and Kellett, 1935, Geol. Soc. Am., Spec. Paper 1, p. 332.

Length, 1.69 mm; height, 1.01 mm.

Renault formation, locality 12, common.

Two specimens from the Renault, although somewhat crushed, agree very closely with Ulrich's figures of the Kentucky Salem species. Little doubt is felt that they are the same because of the unusual features possessed by *H. granifera.*

HOLLINELLA LONGISPINA (Jones and Kirkby)

Plate 9, figures 48-49

Beyrichia longispina Jones and Kirkby, 1886, Ann. Mag. Nat. Hist., ser. 5, vol. 18, p. 257, pl. 8, fig. 3, Carboniferous of Great Britain.

Hollina longispina. Ulrich and Bassler, 1908, Proc. U. S. Nat. Mus., vol. 35, p. 316.—Latham, 1933, Trans. Roy. Soc. Edinburgh, vol. 57, pt. 2, p. 361, fig. 9, Carboniferous of Great Britain.

Hollina stephanovi Batalina, 1924, Com. Geol., Leningrad, Bull. 43, p. 1335, pl. 23, figs. 23, 24.

Length, 1.24 mm; height, 0.77 mm.

Renault formation, localities 12 and 14, common.

The Renault specimens agree with Jones and Kirkby's species in the presence of two large spines, one on the postero-ventral margin and the other almost exactly below the large node on the antero-ventral margin; in the spinose free margins; in the retral swing of the valves, although in the British form this is somewhat more pronounced; and in the lack of a frill or marginal flange.

Although not mentioned in the description, the British form also seems to have an inflated area between the nodes and the ventral margin as in the species shown here. The smaller node is poorly developed. It differs from *H. granifera* (Ulrich) in the lack of the frill, the presence of a spinose margin with two very large spines, and in the distinct retral swing.

Hollinella radiata (Jones and Kirkby)

Plate 9, figures 42-44

Beyrichia radiata Jones and Kirkby, 1886, Ann. Mag. Nat. Hist., ser. 5, vol. 18, p. 257, pl. 8, figs. 1, 2a, b, Carboniferous of Great Britain.

Beyrichia radiata cestriensis Ulrich, 1891, Jour. Cincinnati Soc. Nat. Hist., vol. 13, p. 204, pl. 14, figs. 4a, b.

Hollina radiata cestriensis. Ulrich and Bassler, 1908, Proc. U. S. Nat. Mus., vol. 35, p. 315, pl. 42, figs. 19, 20.

Hollina radiata. Latham, 1933, Trans. Roy. Soc. Edinburgh, vol. 57, pt. 2, pp. 359, 360, fig. 8.

Hollina avonensis Latham, 1933, ibid., p. 360, fig. 9.

Hollinella cestriensis. Bassler and Kellett, 1935, Geol. Soc. Am., Spec. Paper 1, p. 332.

Hollinella radiata. Bassler and Kellett, 1935, ibid., p. 334.

Hollinella typica Morey, 1935, Jour. Paleontology, vol. 9, p. 479, pl. 54, fig. 19, Amsden formation.

Hollinella sp., Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 341, pl. 9, fig. 15, Clore formation.

Hollinella moreyi Croneis and Bristol, 1939, idem., vol. 34, p. 77, pl. 4, fig. 18, Menard formation.

Carapace subrhomboidal, with moderate retral swing; ends rounded, cardinal angles obtuse; hinge straight; anterior node even with or below hinge line and more than twice diameter of posterior one; sulcus deep, narrow, located between nodes just behind midpoint of shell; surface coarsely punctate, sparsely to thickly spinose, margins and cardinal angles often carrying well-developed somewhat larger spines; frill wide, flaring, occupying about three-fourths of free margin, often quite variable in width and in the angle of attachment to shell, sometimes turning sharply outward, sometimes directed downward.

Length, 1.34 mm; height, 0.78 mm.

Glen Dean formation, locality 1, rare; Vienna formation, locality 10, common; Menard formation, locality 7, common; Clore formation, locality 26, rare; Kinkaid formation, locality 5, common.

The study of specimens from the Illinois Chester, ranging from the Glen Dean to the Kinkaid, and a close scrutiny of the published species from comparable horizons elsewhere, have convinced me that the variable character of the minor details makes it impossible to distinguish separate species from these formations. The position of the large node with reference to the dorsal margin, the variations in surface markings, and the changing character of the frill all appear to be quite variable.

Family Kirkbyidae Ulrich and Bassler

Genus Discoidella Croneis and Gale

Discoidella ampla Cooper, n. sp.

Plate 9, figures 36-37

Carapace very small, disc-shaped, outline subcircular, thickest in dorso-central area; very coarse reticulae in irregular rows subparallel to venter, becoming larger and more irregular in arrangement toward dorsum; cardinal area short, wide, somewhat depressed; dorsal angles subequal.

Length, 0.45 mm; height, 0.42 mm; thickness, 0.25 mm.

Renault formation, locality 9, rare.

D. ampla differs from other described species in the position of greatest thickness located near the dorsum, its larger size, and depressed cardinal area.

Genus Kirkbya Jones

Kirkbya elongata Cooper, n. sp.

Plate 10, figure 50

Carapace elongate, narrow, with prominent retral swing; hinge line straight in lateral view except for small offset at each end; anterior shoulder prominent, posterior faint; inner frill narrow, upturned; greatest thickness well forward of and slightly above center; posterior cardinal angle 90°, anterior angle acute; surface markings not preserved.

Length, 0.87 mm; height, 0.37 mm.

Paint Creek formation, locality 2, rare.

Kirkbya humerosa Cooper, n. sp.

Plate 10, figures 47-49

Carapace thick, elongate, hinge straight, dorsal and lateral outlines asymmetrical; anterior shoulder prominent, extending slightly above hinge line; cardinal angles

acute, posterior greater; hinge line very slightly channelled; second false keel upturned or flaring, somewhat separated from first, flare making ends of valves strongly concave near the keel; upper-middle area strongly convex; reticulations polygonal, of average size; pit ovate, located well below center of shell.

Length, 1.17 mm; height, 0.58 mm; thickness, 0.67 mm.

Kinkaid formation, locality 3, common.

K. humerosa may be distinguished from *K. symmetrica* Croneis and Thurman by the more prominent shoulder, asymmetrical outline, and by the more closely spaced false keels.

Kirkby cf. reflexa Girty

Plate 10, figures 27-28

Kirkbya reflexa (not *Amphissites reflexus*) Girty, 1910, Ann. New York Acad. Sci., vol. 20, p. 235, Fayetteville shale.

Length, 1.13 mm; height, 0.53 mm; thickness, 0.46 mm.

Golconda formation, locality 17, rare.

Genus Kirkbyella Coryell and Booth

Kirkbyella sulcata Cooper, n. sp.

Plate 10, figures 13-14

Carapace ovate, ends rounded; dorsum slightly curved, venter slightly concave; greatest height anterior; greatest thickness midway between dorsum and venter, back of median sulcus which is deepest ventrally; ventral ridge terminated abruptly by vertical furrow crossing posterior end of shell near margin; surface reticulae in sublongitudinal rows.

Length, 0.43 mm; height, 0.25 mm; thickness, 0.20 mm.

Paint Creek formation, locality 2, rare.

Resembles *K. truncata* n. sp. in the posterior vertical furrow, but differs in the narrowing of the posterior end and the concave venter.

Kirkbyella truncata Cooper, n. sp.

Plate 10, figures 8-9

Carapace ovate in lateral view, anterior end rounded, posterior straight, vertical; dorsum and venter slightly convex; greatest thickness near venter; vertical sulcus-like trough crosses posterior end near margin resulting in pinched-in appearance in dorsal view; median sulcus shallow; surface reticulae in subhorizontal rows, producing irregularly striated appearance.

Length, 0.48 mm; height, 0.30 mm; thickness, 0.21 mm.

Menard formation, locality 30, rare.

This species differs from most *Kirkbyella* by the vertical trough near the posterior end, and from *K. sulcata* n. sp. by its more quadrate outline.

Genus Savagella Geis

Savagella? acuminata Cooper, n. sp.

Plate 11, figures 7-9

Carapace subrhomboidal in lateral view, ends rounded; dorsum straight, venter slightly curved; forward swing moderate; dorsal outline strongly acuminate; hinge straight, slight narrow channel in posterior half, small notch at posterior end; pit small, shallow, circular, located just above and in front of center; overlap right over left; very indistinct around free margins; surface marked by coarse reticulations, quite variable in size and shape; greatest thickness in postero-ventral quarter; greatest height anterior.

Length, 0.91 mm; height, 0.51 mm; thickness, 0.51 mm.

Renault formation, locality 12, rare; Golconda formation, locality 18, rare; Vienna formation, locality 10, rare; Menard formation, locality 20, rare.

The overlap of this species, although quite indistinct, is opposite to that given by Geis (1932, p. 168) for the Salem species. *S. acuminata* also resembles *Kirkbyella* Coryell and Booth in the position of greatest tumidity, but lacks the sulcus and the lobe bordering the venter. The general lateral outline, surface markings and the pit favor the classification with *Savagella.*

Subfamily Amphissitinae

Cooper, n. subfam.

The original description of *Amphissites* was emended and enlarged by Knight (1928) and by Roth (1929). The latter considers *Amphissites* a subgenus of *Kirkbya* while Knight, and Bassler and Kellett (1934) have followed the original author by giving it generic rank. Recent work on Carboniferous ostracode faunas, especially

those from the Chester formations, has shown the need for finer discrimination among the forms hitherto grouped under this genus.

The holotype *A. rugosus* Girty is characteristic of a group of species occurring in the Chester series and the Pennsylvanian and Permian systems. These species possess a single node or swelling, centrally located, and two or more carinae or false keels, parallel or subparallel to the free margins of the carapace. *A. centronotus* Ulrich and Bassler is another good representative.

Another group of species is intermediate between the genotypes of *Amphissites* and *Kirkbya.* This group possesses one or more carinae and a prominent and characteristic kirkbyan pit but lacks the wing-like terminations of *Kirkbya,* as well as the central node, and the prominent kirkbyan shoulder. The surface reticulations are often coarser than those found on most species of *Amphissites.*

The third group which is especially characteristic of the Chester series and of many Pennsylvanian formations, possesses three nodes. Some species develop swellings in the antero- and postero-ventral corners, thus approaching a five-node form. The terminal nodes near the dorsal margin may be short and similar to the central node or, as is often the case, they may be elongated to form ridges which are subparallel to the anterior and posterior free margins.

All three groups possess the typical kirkbyan characters, namely: the subcentral pit, straight hinge line, one or more carina or false keels, and a pronounced reticulated surface. It is proposed to restrict the name *Amphissites* to the forms characterized by the genotype *A. rugosus* and recognize the other two groups as genera for which the names *Ectodemites* and *Polytylites* are proposed. The subfamily Amphissitinae would include, in addition to these groups, the allied genera *Knightina, Balantoides,* and *Ulrichia* at least in part. There is some question concerning the actual occurrence of a sulcus between the two nodes of *Ulrichia,* and if one is not present, this genus should, beyond question, belong to the Kirkbyidae and probably to the subfamily Amphissitinae.

The several criteria for orientation of ostracodes have been variously interpreted for the Amphissitinae by different authors, so that considerable confusion is prevalent. In the original description of the genotype, *Amphissites rugosus,* Girty (1910) regarded the overlap as right over left. In this he was followed by Roundy (1926) who figured the genotype for the first time. Roth (1929) reversed this orientation, emphasizing the position of the teeth on the cardinal extremities of what he considered the left valve. Roth was followed by Knight (1928), Kellett (1934), and others, but Bradfield (1935) and Payne (1937) reverted to the original orientation of Girty. Some authors have confused the issue by following one or the other of these methods and then inconsistently orienting their figures. The original orientation of Girty has been followed because this places the dorsal shoulder posterior, making the greatest height and width of the shell posterior. The swing of the valves, which is very slight if present in this group at all, is believed to be of little value in orienting these forms.

Genus Amphissites Girty, restricted Cooper

Amphissites, in part, of authors.

Kirkbyidae with single, usually large node, located centrally or nearly so, between anterior and posterior ends, commonly slightly above line midway between dorsal and ventral margins; small elliptical pit located at postero-ventral edge of node; valves subequal, right slightly overlapping left; one or two false keels paralleling ventral margin but joining at cardinal extremities; another carina, not completely encircling ventral node, joins a straight ridge parallel to hinge line; short ridge joins inner carina at about 90°, giving cardinal area appearance of narrow shield, with broadest end posterior (see pl. 9, figs. 1, 19, 34); surface reticulate.

Amphissites carinatus Cooper, n. sp.

Plate 9, figures 19-21

Amphissites centronotus? Croneis and Gale, 1938, Denison Univ., Jour. Sci. Lab., Bull. 33, p. 270, pl. 5, fig. 9, Golconda formation.

Carapace short, thick and high, coarsely reticulate, marked by prominent carinae; node large, oval, slightly elongate horizontally, and lying just above center of shell

about midway between ends; second keel located well downward in lateral view appears almost to coincide with free margin; narrow shield-like appearance produced by carina around cardinal area pronounced; inner carinae parallel to middle one, terminate along line extending horizontally through pit; pit oval, directly beneath node but slightly flattened at top.

Length, 0.93 mm; height, 0.60 mm; thickness, 0.61 mm.

Golconda formation, locality 17, rare; Glen Dean formation, locality 11, abundant.

A. carinatus on first examination appears to be identical with *A. centronotus* (Ulrich and Bassler), but the following differences may be noted: the form ratio of the Chester species is 1.5 while the average of the many published figures of *A. centronotus* is more than 1.7; the pit is more centrally located and much larger; and the central keel is much closer to the free margins than in the younger species. The form described from the Golconda by Croneis and Gale is probably a crushed specimen.

Amphissites exiguus Cooper, n. sp.

Plate 9, figures 13-15

Carapace small, asymmetrical in lateral view, anterior end lowest; inner carina prominently developed as broad, smooth flange, not parallel to outer carina; node very small, central; pit small, almost indistinguishable; anterior shoulder broad, not keel-like; reticulations fine and irregularly arranged; hinge line straight and depressed.

Length, 0.50 mm; height, 0.30 mm; thickness, 0.29 mm.

Kinkaid formation, locality 3, rare.

This species is similar to *A. carinatus* n. sp. in dorsal area, but differs in possessing a higher inner carina, a much smaller central node, and a broad anterior shoulder as contrasted to the antero-dorsal carina of the latter species.

Amphissites quadratus Cooper, n. sp.

Plate 9, figure 4

Carapace elongate, somewhat rectangular, small round central node directly above deep oval pit; outer carina smooth, prominent, parallel to free margin; inner carina poorly developed at each end, subparallel to outer one; inner ridges faint, joining ridge parallel to the hinge line; reticulations of medium size, more or less without orderly arrangement.

Length, 0. 69 mm; height, 0.40 m.

Kinkaid formation, locality 3, common.

Amphissites rugosus Girty

Plate 9, figures 1-3

Amphissites rugosus Girty, 1910, Ann. New York Acad. Sci., vol. 20, p. 236, Fayetteville shale.
——Roundy, 1926, U. S. Geol. Survey, Prof. Paper 146, p. 7, pl. 1, figs. 1a-c, Barnett shale.
Amphissites weaveri Roth, 1929, Wagner Free Ins. Sci., vol. 1, pp. 9, 36, 39, pl. 2, figs. 11a-c.

Length, 0.80 mm; height, 0.46; thickness, 0.45 mm.

Kinkaid formation, locality 3, rare.

The Kinkaid specimen, although smaller than the holotype, has the same form ratio, 1.7. The arrangement and number of carina, and character of reticulations also correspond so that this form has been confidently identified with Girty's species.

Genus Ectodemites Cooper, n. gen.

Amphissites, in part, of authors.

Kirkbyidae with regularly convex, or inflated, ovate carapace, marked by one or more false keels but without well-defined nodes; regularity of curvature often interrupted by slight swelling near central portion above pit.

Genotype.—*Ectodemites primus* n. sp.

This genus differs from *Knightina* in the absence of the prominent kirkbyan shoulder. The slight central swelling of *Ectodemites* should not be confused with the well defined central node of *Amphissites* and *Polytylites.*

Ectodemites bicarinatus (Croneis and Thurman)

Plate 9, figures 50-51

Amphissites bicarinatus Croneis and Thurman, 1938, Denison Univ. Bull., Jour. Sci. Lab., vol. 33, p. 311, pl. 7, figs. 10-12, Kinkaid formation.

Length, 0.91 mm; height, 0.55 mm; thickness, 0.55 mm.

Vienna formation, locality 10, common; Menard formation, locality 7, rare; Kinkaid formation, locality 28, depth 628-33 feet, common.

Ectodemites costelliferus (Croneis and Bristol)

Plate 9, figure 22

Amphissites costellifera Croneis and Bristol, 1939, Denison Univ. Bull., Jour. Sci. Lab., vol. 34, p. 80, pl. 4, fig. 5, Menard formation.

Amphissites decipiens Croneis and Bristol, 1939, idem., p. 81, pl. 4, fig. 4, Menard formation.

Length, 1.0 mm; height, 0.55 mm.

Golconda formation, locality 8, rare; Vienna formation, locality 10, rare; Menard formation, locality 28, rare.

Ectodemites elongatus Cooper, n. sp.

Plate 9, figures 24-25

Carapace long, high, greatest thickness almost central; anterior and central swellings joined by very low saddle, the former but slightly elevated above hinge line, ending at inner carina; pit well below center, elongated horizontally, deep; reticulations polygonal to ovate, regularly disposed with reference to carina; inner carina merges with line between two adjacent rows of reticulations about half way between pit and posterior end.

Length, 0.79 mm; height, 0.47 mm; thickness, 0.42 mm.

Kinkaid formation, locality 6, rare.

Ectodemites magnireticulatus Cooper, n. sp.

Plate 9, figures 16-17

Carapace subrectangular; dorsum straight, venter slightly concave, subparallel to dorsum, ends rounded; retral swing slight; surface very coarsely reticulate, smoothly convex, without nodes or shoulders; pit slightly below center, equidistant from ends; hinge straight, slightly depressed; one very faint false keel closely parallels venter.

Length, 0.74 mm; height, 0.38 mm; thickness, 0.31 mm.

Paint Creek formation, locality 2, rare.

Ectodemites cf. monomastadis (Coryell and Sohn)

Plate 9, figure 35

Amphissites monomastadis Coryell and Sohn, 1938, Jour. Paleontology, vol. 12, p. 602, pl. 69, figs. 10a, b, Reynolds limestone.

Length, 0.86 mm; height, 0.49 mm.

Menard formation, locality 30, rare.

Ectodemites obesus (Croneis and Gale)

Plate 9, figures 28-29

Amphissites obesus Croneis and Gale, 1938, Denison Univ. Bull., Jour. Sci. Lab., vol. 33, p. 270, figs. 2, 3, Golconda formation.

Length, 0,78 mm; height, 0.42 mm; thickness, 0.44 mm.

Renault formation, locality 12, common; Paint Creek formation, locality 2, rare; Golconda formation, locality 28, depth 1068-69 feet, rare.

Ectodemites oblongus (Jones and Kirkby)

Plate 9, figure 23

Kirkbya oblonga Jones and Kirkby, 1885, Ann. Mag. Nat. Hist., ser. 5, vol. 15, p. 181, pl. 3, figs. 6a, b. Carboniferous of Great Britain. ——Ulrich, 1891, Jour. Cincinnati Soc. Nat. Hist., vol. 13, p. 206. pl. 18, figs. 4, 5, Chester series.

Amphissites oblonga. Roth, 1929, Wagner Free Inst. Sci., Pub., vol. 1, p. 8.

Length, 0.86 mm; height, 0.47 mm.

Vienna formation, locality 10, common.

Ectodemites parvus Cooper, n. sp.

Plate 9, figures 30-31

Carapace small, elongate, somewhat rectangular in lateral view, surface finely reticulate; false keels poorly developed, inner one almost indistinguishable; dorsal area considerably flattened, but rising posteriorly considerably above remainder of hinge line; median and anterior swellings separated by fairly prominent saddle; pit oval, very distinct.

Length, 0.71 mm; height, 0.28 mm; thickness, 0.32 mm.

Menard formation, locality 7, common.

This species closely approaches *Amphissites* but lacks the carinal development of that genus, especially in the dorsal area.

Ectodemites planus Cooper, n. sp.

Plate 9, figures 40-41

Carapace elongate, subrectangular in outline, lenticular in dorsal view; central swelling does not interrupt the regular line of curvature; carina indistinct; surface reticulae coarse and concentric; anterior shoulder absent; cardinal angles well rounded; pit located well below center, equidistant from the extermities of shell.

Length, 0.89 mm; height, 0.46 mm; thickness, 0.40 mm.

Paint Creek formation, locality 24, rare; Golconda formation, locality 8, common.

Ectodemites primus Cooper, n. sp.

Plate 9, figures 46-47

Carapace large, elliptical in dorsal view, central and anterior swellings merged to form greatly inflated antero-dorsal quadrant; enlarged portion begins just back of and above pit, continues upward to above hinge line and foward to inner carina; carinae somewhat low, smooth, diverging anteriorly; reticulations medium-sized, hexagonal for the most part, fairly regular especially between the carina.

Length, 0.84 mm; height, 0.49 mm; thickness, 0.53 mm.

Kinkaid formation, locality 5, common.

Ectodemites quadratus Cooper, n. sp.

Plate 10, figures 11-12

Carapace tumid, quadrate in lateral outline, dorsum and venter straight, parallel; ends rounded; pit elongate, almost horizontal, subcentral; keels low, indistinct, inner one only being continuous around entire free margin; posterior end truncate; surface irregularly marked with polygonal reticulations, irregular in size and shape, smallest in center, becoming larger and more irregular in shape toward ends and venter; greatest length and thickness central.

Length, 0.80 mm; height, 0.46 mm; thickness, 0.49 mm.

Paint Creek formation, locality 21, depth 1304-43 feet, rare.

E. quadradus may be distinguished from *E. planus* n. sp. by its irregular reticulate pattern, greater thickness, and lower form ratio.

Ectodemites tumidus Cooper, n. sp.

Plate 10, figures 1-3

Carapace short, thick, widest on anterior end due to prominence of well-developed shoulder; central swelling rising gradually from cardinal area, ending abruptly just above median pit; outer carina parallel to free margin, inner one becoming more widely separated from first toward anterior end; reticulations subcircular to polygonal.

Length, 0.60 mm; height, 0.33 mm; thickness, 0.37 mm.

Clore formation, locality 26, common; Kinkaid formation, locality 3, rare.

This species somewhat resembles *Amphissites* due to the prominence of the central swelling; however, this feature is not well defined except on the ventral side near the pit.

Ectodemites warei (Morey)

Plate 10, figure 22

Amphissites warei Morey, 1935, Jour. Paleontology, vol. 9, p. 477, pl. 54, fig. 7, Amsden formation.

Length, 0.63 mm; height, 0.38 mm.

Clore formation, locality 26, common; Kinkaid formation, locality 5, common.

Genus Polytylites Cooper, n. gen.

Amphissites, in part, of authors.

Mauryella Harlton, 1929, Am. Jour. Sci., ser. 5, vol. 18, p. 257, pl. 1, fig. 5.

Kirkbyidae with small to large, circular to ovate central node, with low to prominent, short to elongate shoulders or swellings in dorsal extermities. When the latter are short and prominent the carapace has a trinodal appearance. A few species have swellings at the ventral extremities, producing a form with a five-noded appearance, as in *Polytylites quincollinus* (Harlton). Surface marked by kirkbyan pit below central node and fine to coarse reticulations; one to two carina more or less parallel to free margin.

Genotype.—*Polytylites geniculatus* n. sp.

Polytylites ambitus Cooper, n. sp.

Plate 10, figure 46

Carapace large, subrectangular, with very prominent flange-like inner carina, outer one poorly or not at all developed; central node large, circular, well above and behind center of shell; anterior shoulder large, projecting well above hinge, located some distance from anterior margin; pit large, deep, situated on antero-ventral margin of central node; surface finely reticulate.

Length, 0.89 mm; height, 0.53 mm.

Renault formation, locality 12, rare.

This species may be distinguished by the subcentral position of the central node, the upper margin of which almost reaches the hinge line, and the unusually large flat area developed in front of the anterior shoulder.

Polytylites biforatus (Croneis and Thurman)

Plate 10, figure 23

Amphissites biforatus Croneis and Thurman, 1938, Denison Univ. Bull., Jour. Sci. Lab., vol. 33, p. 312, pl. 8, figure 9, Kinkaid formation.

Length, 0.87 mm; height, 0.46 mm.

Golconda formation, locality 8, common.

Polytylites bradfieldi (Croneis and Funkhouser)

Plate 10, figures 24-26

Amphissites bradfieldi (not *A. rothi*) Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 346, pl. 10, fig. 15, Clore formation.

Amphissites lineatus Croneis and Bristol, 1939, idem. vol. 34, p. 83, pl. 4, figs. 1, 2, Menard formation.

Length, 1.0 mm; height, 0.58 mm; thickness, 0.55 mm.

Renault formation, locality 9, common; Vienna formation, locality 10, abundant; Menard formation, locality 30, common; Clore formation, locality 4, abundant; Kinkaid formation, locality 5, common.

Polytylites concavus (Croneis and Bristol)

Amphissites concavus Croneis and Bristol, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 79, pl. 4, figs. 8, 9, Menard formation.

Polytylites crassus Cooper, n. sp.

Plate 10, figures 15-17

Carapace small, but very thick, highest on posterior end; central node prominent; anterior shoulder high, but of smaller diameter than the node; posterior swelling absent; pit small and indistinct; inner keel distinct, parallel to outer one only in postero-ventral region; reticulations fine.

Length, 0.40 mm; height, 0.24 mm; thickness, 0.27 mm.

Kinkaid formation, locality 3, common.

Polytylites directus Cooper, n. sp.

Plate 10, figure 43

Carapace flat, with three nodes and prominent inner keel rising abruptly from surface; anterior and central nodes distinctly elongate vertically posterior node almost circular; inner keel unusually high, parallel to free margin, except at posterior extremity; inner side marked by single row of pits elongated radially; in dorsal view space between the two carinae occupied by at least five rows of reticulae; pit small, subcircular, slightly forward of ventral end of central node.

Length, 0.98 mm; height, 0.53 mm.

Glen Dean formation, locality 1, rare.

Polytylites diversus Cooper, n. sp.

Plate 10, figure 4

Carapace small, thicker but much lower on anterior end; greatest height through posterior end of hinge; anterior shoulder and central node poorly developed; pit slightly forward of and below center of shell; surface marked by comparatively coarse reticulations; inner keel parallel to outer one along ventral margin only, diverging at either end.

Length, 0.43 mm; height, 0.27 mm.

Vienna formation, locality 10, rare.

Polytylites elongatus (Croneis and Bristol)

Plate 10, figure 44

Amphissites elongatus Croneis and Bristol, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 81, pl. 4, fig. 10, Menard formation.

Length, 0.97 mm; height, 0.56 mm.

Kinkaid formation, locality 5, common.

Polytylites fossilis (Croneis and Thurman)

Plate 10, figures 51-52

Amphissites fossilis Croneis and Thurman, 1938, Denison Univ. Bull., Jour. Sci. Lab., vol. 33, p. 312, pl. 8, fig. 18, Kinkaid formation.

Length, 0.85 mm; height, 0.47 mm.

Renault formation, locality 9, common; Paint Creek formation, locality 2, rare; Golconda formation, locality 8, common.

Polytylites geniculatus Cooper, n. sp.

Plate 10, figures 34-37

Carapace small, somewhat rectangular in outline, with inner sharp, well-defined carina marking broad curve nowhere parallel to outer one; small, round node rises abruptly (and is relatively high) from shell surface, a little above and behind cen-

ter, placing kirkbyan pit exactly at its antero-ventral edge; anterior shoulder rises well above hinge line, somewhat larger than central node; posterior node much smaller, barely rises above the hinge; reticulations fairly coarse especially near keels; several short, thin spine-like protuberances also mark surface.

Length, 0.68 mm; height, 0.40 mm; thickness, 0.38 mm.

Renault formation, locality 9, common; Vienna formation, locality 10, abundant.

Polytylites grovei (Croneis and Gutke)

Amphissites grovei Croneis and Gutke, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, pl. 2, figs. 28, 29, Renault formation.

Polytylites? nodobliquus (Croneis and Gale)

Plate 10, figures 38-41

Knightina nodobliqua Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 274, pl. 5, fig. 1, Golconda formation.

Carapace large, rectangular, with large oval central node elongated along line rising a little toward anterior end; terminal swellings not sharply defined, rise gradually to form regular ridges sharply curved posteriorly to parallel the single very faint carina; carina not keel-like, but broad and rounded, forming a broad, flat area along ventral margin; anterior shoulder elevated but little above hinge line and gradually dies out on a line slightly below pit; reticulations fine to coarse, elongate on the carina.

Length, 0.97 mm; height, 0.50 mm; thickness, 0.58 mm.

Renault formation, locality 12, rare; Paint Creek formation, locality 24, rare; Golconda formation, locality 8, common; Vienna formation, locality 10, common.

Polytylites quincollinus (Harlton)

Plate 10, figure 45

Mauryella quincollina Harlton, 1929, Am. Jour. Sci., ser. 5, vol. 18, p. 257, pl. 1, fig. 5, Fayetteville shale.

Carapace large, rectangular in outline; coarse surface reticulations interrupted by five nodes or swellings; central and antero-dorsal nodes rise abruptly, others are lower and rise gradually above surface; reticulations apparently without orderly arrangement and occur without interruptions over all protuberances; inner keel almost obliterated by ventral nodes which form prominent saddle just below central node; pit deep, elliptical, with long axis 45° to horizontal, rising toward anterior end.

Length, 0.91 mm; height, 0.51 mm.

Renault formation, locality 9, rare.

This species, because of its five swellings, large size, and coarse reticulations has been identified as *P. quincollinus* (Harlton). Comparative material from the lower Fayetteville shows some variation in size and extent of the ventral swellings. Some forms also axhibit a more orderly arrangement of reticulations than does the specimen from the Renault.

Polytylites reticulatus Cooper, n. sp.

Plate 10, figure 10

Carapace coarsely reticulate, especially in area between two false keels; first carina parallel to free margin; central node relatively small, almost round, with kirkbyan pit at antero-ventral edge; inner carina subparallel somewhat widely separated from outer one by four rows of very large, oval to subangular reticulations; anterior node well developed, larger than central node, projecting well above hinge line; posterior node small, inclined slightly forward from vertical, projecting slightly above hinge line.

Length, 1.06 mm; height, 0.60 mm.

Clore formation, locality 4, abudant.

Polytylites similis (Croneis and Gale)

Amphissites similis Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 269, pl. 5, fig. 6, Golconda formation.

Polytylites sublineatus (Croneis and Thurman)

Plate 11, figure 24

Amphissites sublineatus Croneis and Thurman, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 315, pl. 8, fig. 16, Kinkaid formation.

Length, 1.05 mm; height, 0.67 mm.

Kinkaid formation, locality 5, common.

Polytylites superus (Croneis and Gale)

Plate 11, figures 6, 17

Amphissites superus Croneis and Gale, 1938, Denison Univ. Bull., Jour. Sci. Lab., vol. 33, p. 272, pl. 5, figs. 13, 14, Golconda formation.

Length, 0.89 mm; height, 0.55 mm.

Golconda formation, locality 16, common; Glen Dean formation, locality 1, rare; Menard formation, locality 7, common.

Polytylites tricollinus (Jones and Kirkby)

Plate 11, figures 1-4

Kirkbya tricollina Jones and Kirkby, 1886, Ann. Mag. Nat. Hist., ser. 5, vol. 18, p. 261, pl. 8, fig. 19, Carboniferous of England.——Ulrich, 1891, Jour. Cincinnati Soc. Nat. Hist., vol. 13, p. 207, pl. 18, figs. 8a, b, Chester series.

Amphissites tricollina. Roth, 1929, Wagner Free Inst. Sci. Pub., vol. 1, p. 3.——Bassler and Kellett, 1935, Geol. Soc. Am., Spec. Paper 1, p. 155.

Length, 0.78 mm; height, 0.45 mm; thickness, 0.40 mm.

Glen Dean formation, locality 1, rare.

Polytylites trilobus (Croneis and Gale)

Plate 11, figure 5

Amphissites trilobus Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 271, pl. 5, fig. 5, Golconda formation.

Length, 1.0 mm; height, 0.55 mm.

Golconda formation, locality 16, rare.

Polytylites wilsoni (Croneis and Gutke)

Plate 11, figures 22-23

Amphissites wilsoni Croneis and Gutke, 1939, Denison Univ. Bull., Jour. Sci. Lab., vol. 34, p. 47, pl. 2, figs. 24, 25, Renault formation.

Length, 0.78 mm; height, 0.44 mm; thickness, 0.40 mm.

Renault formation, locality 9, common.

Family Kloedenellidae Ulrich and Bassler

Genus Chesterella Croneis and Gutke

Chesterella? incerta Cooper, n. sp.

Plate 11, figures 28-30

Carapace subrectangular; hinge straight, with small tooth at posterior end fitting into corresponding process on right valve; valves almost equal in size with little or no apparent overlap, greatest thickness and least height anterior; greatest length almost central or slightly above; ventral lobe rises gradually from posterior, narrowing and terminating abruptly just beneath node in antero-dorsal quarter; posterior node just back of center.

Length, 0.55 mm; height, 0.30 mm; thickness, 0.30 mm.

Renault formation, locality 25, common.

The orientation of this genus is reversed from that given by Croneis and Gale because of the backward swing of the valves in lateral view, and by reference to the family description, the hinge process is located posteriorly. The generic designation of *C. incerta* and *C. fissurata* Croneis and Gale have been questioned due to the great similarity of these forms to *Jonesina.* This is not true for *C. exuta* Croneis and Gale, which appears to possess characters quite different from those of any other described genus. *C. incerta* is distinguished from *C. fissurata* by the narrower anterior end in lateral view.

Genus Deloia Croneis and Thurman

Deloia spinosa Croneis and Bristol

Plate 11, figure 18

Deloia spinosa Croneis and Bristol, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 73, pl. 3, fig. 21, Menard formation.

Leightonella torta Croneis and Gale, 1938, idem., vol. 33, p. 263, pl. 5, fig. 19, Golconda formation.

Length, 0.95 mm; height, 0.51 mm.

Renault formation, locality 9, rare; Glen Dean formation?, locality 1, rare; Vienna formation, locality 10, rare; Menard formation, locality 7, rare; Kinkaid formation, locality 3, rare.

Deloia tumida Cooper, n. sp.

Plate 11, figures 13-14

Carapace ovate, hinge straight; posterior end rounded, anterior margin meets dorsum in obtuse angle; valves flat, except at posterior end, where postero-dorsal quarter is abruptly inflated; free margin coarsely fringed.

Length, 0.75 mm; height, 0.44 mm; thickness, 0.29 mm.

Kinkaid formation, locality 3, rare.

The flatness of the valves is probably accentuated by some crushing, but it is believed that the abrupt swelling would still be very prominent in an uninjured specimen.

Genus Denisonia Croneis and Bristol

Denisonia brevicosta Cooper, n. sp.

Plate 11, figures 40-41

Carapace elongate, with slight backward swing, ends rounded; dorsum straight,

venter curved; anterior end thickest but narrower than posterior; sulcus postcentral, traversed by short, thin rib or carina inclined toward venter, anteriorly merging with thickening of valve at this point, terminating abruptly just back of sulcus; valves irregularly inflated anteriorly, less so between sulcus and venter, producing shallow saddle-like area in antero-ventral quarter; edges near free margins abruptly upturned in false keel or basal portion of frill, which has been broken completely from this specimen.

Length, 0.82 mm; height, 0.46 mm; thickness, 0.31 mm.

Golconda formation, locality 22, rare.

Denisonia cirrata Cooper, n. sp.

Plate 11, figure 34

Carapace elongate, posterior swing pronounced; dorsal line straight, ends rounded, venter curved; greatest height postcentral; valve uniformly inflated around deep sulcus located postdorsally of center; sulcus traversed by short, triangular platform-like rib rising almost perpendicular from surface; rib widest anteriorly, merging with surface of shell behind sulcus; hingement cardine; frill composed of elongate, needle-like spines in row which parallels free margins.

Length, 0.71 mm; height, 0.38 mm.

Golconda formation, locality 18, rare.

This species is distinguished by its prominent backward swing and by its short and unusually wide carina.

Genus Geffenina Coryell and Sohn

Geffenina? praelonga Cooper, n. sp.

Plate 11, figures 42-44

Carapace large, elongate, ends rounded; dorsal margin straight, venter broadly curved; overlap around entire free margin, very prominent, especially on anterior end; hinge straight, slightly more than half length of shell, slightly depressed and notched at ends; greatest thickness and height in anterior quarter; greatest length central; median sulcus deepest midway between dorsum and venter, becoming shallower upward; posterior sinus indistinct, resulting in poorly-defined lobe.

Length, 0.95 mm; height, 0.58 mm; thickness, 0.51 mm.

Golconda formation, locality 19, common.

Genus Jonesina Ulrich and Bassler, emend. Cooper

Jonesina, in the original description, was included in the family Beyrichiidae, subfamily Kloedenellinae, the latter being subsequently raised to family rank. In their remarks on the Kloedenellinae Ulrich and Bassler (1908, p. 320) describe the "valves as more or less distinctly overlapping. As a rule, the overlap is confined to the ventral side and ends." The genotype by original designation is *Beyrichia fastigiata* Jones and Kirkby from Carboniferous (Mississippian) beds of Scotland. Unfortunately, one of the figures reproduced by Ulrich and Bassler to illustrate the genotype shows an overlap along the dorsal margin. Neither Jones and Kirkby nor Ulrich and Bassler give adequate description of the hingement. Kellett (1933, p. 76) explains the dorsal overlap in this figure as the "thickened edge of the left valve showing around the cast of the right." Bassler and Kellett's (1934) description of *Jonesina* fits several genera of Kloedenellidae equally well, for instance *Sansabella.* Roundy describes the hinge of *Sansabella* as "straight, equal in both valves and, in part, slightly lower than the dorsal margins of the two valves, giving an excavated or channeled appearance in the dorsal view of a bivalved specimen." In addition to the channel the *Sansabella* hinge contains a delta-shaped notch at each end of the hinge line, the apical point of the delta pointing to and overlapping the smaller valve. These features, namely the straight hinge line, V-shaped in cross-section, and termination at each end by a triangular notch constitute the sansabelloid hingement of many descriptions, not only of *Sansabella,* but of a number of subsequently described genera.

Kellett (1933, p. 77) thinks it "would be well to place in the genus *Sansabella* only those species which are known to have the well developed denticulation as decribed by Roundy." By the same token it might be said that *all* species with the sansabelloid hinge should belong in Roundy's genus.

The large number of reversed forms of *Sansabella* which have been discovered in the Chester series has shown the fallacy of trying to determine generic classification by overlap alone. Overlap, inseparably tied up with orientation, has been the subject of much discussion in recent ostracode literature, and it has shown that, in every description, most careful consideration must be given to these features. Since the hinge serves a most important physiological need, it seems advisable to consider variations in this feature of sufficient importance to mark generic if not greater differences in shell taxonomy.

It is apparent therefore that *Jonesina* becomes a very restricted genus if all species with the channeled hinge line are removed to *Sansabella* or to *Sansabella*-like genera. An emended description of *Jonesina,* considering all points raised by recent workers, follows:

Carapace ovate, somewhat elongate, thin to obese, greatest thickness posterior; varies in lateral outline from subelliptical to an approximate parallelogram; valves unequal; overlap around entire free margin usually prominent; variously lobed; hinge straight, obscurely cardine, about two-thirds as long as total length of shell; median sulcus opening into cardinal area, usually deep and elongate, before which occur one or more fairly well-defined lobes; surface smooth or reticulate.

The obesity of the posterior half of the carapace may produce a short canoe-shaped channel at the hinge line, but this is not to be confused with the straight V-shaped channel running the entire length of the sansabelloid hinge, nor is the obscure rounded notch present, as at each end of the hinge of *Sansabella.*

Jonesina crateriGera (Brady)

Plate 11, figures 36-39

Beyrichia crateriGera (Brady ms.) Jones, 1886, Geol. Mag. n. s., dec. 3, vol. 3, p. 439, pl. 12, figs. 7a, b, Carboniferous of Great Britain.

Jonesina crateriGera. Ulrich and Bassler, 1908, Proc. U. S. Nat. Mus., vol. 35, p. 324, pl. 44, figs. 13, 14.—? Harlton, 1927, Jour. Paleontology, vol. 1, p. 203, pl. 32, figs. 5a, b, Lower Glenn formation.

Female: length, 1.0 mm; height, 0.53 mm; thickness, 0.49 mm.

Male: length, 0.75 mm; height, 0.40 mm; thickness, 0.33 mm.

Golconda formation, locality 19, rare; Glen Dean formation, locality 1, rare.

Plate 11 shows two specimens, identical in lateral view, but the one from the Golconda is considerably thicker near the posterior end, whereas the Glen Dean form is thickest near the center of the shell. The specimen figured by Harlton lacks the postero-ventral truncation of the Mississippian form.

Jonesina equilatera Cooper, n. sp.

Plate 11, figures 15-16

Carapace ovate, with parallel dorsum and venter; hinge straight, venter slightly convex; ends equal in height and curvature; sinus procentral, narrow at bottom, widening toward dorsal area; overlap prominent, especially along venter; surface smooth.

Length, 1.0 mm; height, 0.60 mm; thickness, 0.36 mm.

Paint Creek formation, locality 2, common.

J. equilatera is distinguished by its almost symmetrical outline and by its thinness.

Jonesina intermedia Croneis and Bristol

Plate 12, figures 8-9

Jonesina intermedia Croneis and Bristol, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 75, pl. 3, figs. 10-11, Menard formation.

Length, 0.64 mm; height, 0.39 mm; thickness, 0.27 mm.

Vienna formation, locality 36, rare.

Jonesina puncta Morey

Plate 12, figures 20-21

Jonesina? puncta Morey, 1935, Jour. Paleontology, vol. 9, p. 476, pl. 54, fig. 1, Amsden formation.—Coryell and Johnson, 1939, ibid., vol. 13, p. 214, pl. 26, fig. 3, Clore formation.

Jonesina consimilis Croneis and Bristol, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 74, pl. 3, figs. 29, 30, Menard formation.

Kloedenella sigurdi Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 215, pl. 26, fig. 2, Clore formation.

Nuferella wellsi Coryell and Sohn, 1938, Jour. Paleontology, vol. 12, p. 602, pl. 69, fig. 9, Reynolds limestone.

Length, 0.73 mm; height, 0.44 mm; thickness, 0.29 mm.

Clore formation, locality 26, rare.

JONESINA SPINIGERA Cooper, n. sp.
Plate 12, figures 16-17

Carapace somewhat elongate, ends rounded; venter broadly curved, dorsum straight; antero-ventral truncation marked, producing distinct retral swing; greatest thickness and height back of center; greatest length central; sulcus fairly shallow, sides parallel for most of length, flaring near cardinal area; overlap prominent only along venter; hinge straight; node or spine short, located in dorsal angles of each valve, that in posterior angle of left valve quite indistinct.

Length, 0.64 mm; height, 0.39 mm; thickness, 0.30 mm.

Paint Creek formation, locality 24, common; Golconda formation, locality 38, rare; Menard formation?, locality 32, rare.

JONESINA TENUISINUOSA Cooper, n. sp.
Plate 12, figures 6-7

Carapace elongate, ends rounded; venter slightly convex; hinge straight; unexcavated, about four-fifths of total length; sinus wide, shallow, almost at midlength; node low, indistinct and located just in front of sinus; anterior cardinal angle obtuse, posterior one almost 90°; slight forward swing; overlap along free margins quite indistinct; surface smooth.

Length, 0.73 mm; height, 0.42 mm; thickness, 0.33 mm.

Golconda formation, locality 19, rare.

Genus KLOEDENELLA Ulrich and Bassler

KLOEDENELLA MACER Cooper, n. sp.
Plate 12, figures 10-11

Carapace elongate, thin, bisulcate; overlap around free margins and at antero- and postero-dorsal corners, the latter resulting in sinuous hinge line in dorsal view; dorsum distinctly bowed in central region; anterior end only slightly curved with pronounced backward swing, forming sharply rounded antero-dorsal angle; median sulcus the larger and almost central, separated from smaller sulcus by low fold; a broad, somewhat swollen area borders median sinus on anterior side, locating greatest thickness anteriorly; widest (highest) portion of shell and small sulcus posterior.

Length, 0.50 mm; height, 0.30 mm; thickness, 0.15 mm.

Glen Dean formation, locality 1, rare.

Genus LOCHRIELLA Scott

The genus *Lochriella* Scott (1941) is intermediate between *Sansabella* and *Neokloedenella,* closely resembling the latter except for a different overlap. *Sansabella* and *Lochriella* have a prominent overlap along the free margins. *Lochriella* and *Neokloedenella* have a channeled dorsum of variable width and depth along the posterior end of the hinge, although the *Sansabella* channel is uniformly straight, narrow, and extends along the entire hinge from notch to notch. *Lochriella* apparently may or may not possess the overlap at the anterior end of the hinge characteristic of all known species of *Neokloedenella.*

LOCHRIELLA FENRIRI
(Coryell and Johnson)
Plate 12, figures 28-29

Sansabella fenriri Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 220, pl. 25, figs. 3a, b, Clore formation.

Length, 1.10 mm; height, 0.67 mm; thickness, 0.63 mm.

Clore formation, locality 27, common.

LOCHRIELLA REVERSA (Morey)
Plate 12, figures 18-19

Sansabella reversa Morey, 1935, Jour. Paleontology, vol. 9, p. 476, pl. 54, fig. 6, Amsden formation.

Sansabella gunnari Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 220, pl. 26, figs. 11a, b, Clore formation.

Reversabella reversa. Coryell and Johnson, idem., p. 221, p. 26, figs. 12a, b, Clore formation.

Length, 1.0 mm; height, 0.67 mm; thickness, 0.50 mm.

Clore formation, locality 27, common.

Genus NEOKLOEDENELLA Croneis and Funkhouser

NEOKLOEDENELLA? MAGNA Cooper, n. sp.
Plate 12, figures 42-43

Carapace ovate, wide; dorsal and ventral margins parallel, latter slightly convex, ends rounded; hinge line straight in posterior two-thirds of its length, then curves to left due to overlap of right valve, straight portion excavated in canoe-shaped channel;

overlap very slight around free margins; sinus indistinct, wide and shallow, located well forward of middle; greatest thickness and height near posterior end, right valve slightly higher than left; greatest length central; surface smooth.

Length, 0.89 mm; height, 0.51 mm; thickness, 0.44 mm.

Golconda formation, locality 19, common.

Genus Perprimitia Croneis and Gutke

Perprimitia Croneis and Gutke, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 257.

This genus possesses, in addition to the features described by Croneis and Gutke, a well developed sansabelloid hinge line and a forward swing to the valves. It is believed that these features together with the distinct overlap and characteristic lobation make this genus conform more closely to the Kloedenellidae than to the Primitiidae. The great variation in tumidity is thought to be sexual although no males and females of the same species have yet been designated, nor has the reversal of valves, as in *Sansabella,* been noted.

Perprimitia elongata Cooper, n. sp.

Plate 12, figures 30-32

Carapace elongate; dorsal margin straight; end rounded; antero-dorsal angle sharp; node and ventral lobe not sharply differentiated but almost imperceptibly joined together; spine short, located unusually far back from posterior end; overlap somewhat indistinct; greatest height anterior; greatest length and thickness central.

Length, 0.45 mm; height, 0.23 mm; thickness, 0.17 mm.

Paint Creek formation, locality 2, common.

This species may be distinguished by its unusual length, due to the relatively great distance between the spine and the ventral lobe. The figured specimen is a male.

Perprimitia funkhouseri Croneis and Thurman

Plate 12, figures 44-45

Perprimitia funkhouseri Croneis and Thurman, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 304, pl. 7, figs. 18, 19, Kinkaid formation.

Jonesina? tumida Croneis and Thurman, idem., p. 305, pl. 7, fig. 11, Kinkaid formation.

Ulrichia emarginata Ulrich, 1891, Jour. Cincinnati Soc. Nat. Hist., vol. 13, p. 203, pl. 12, figs. 10a-c, Chester series.

Length 0.60 mm; height, 0.37 mm; thickness, 0.32 mm.

Clore formation, locality 39, rare; Kinkaid formation, locality 28, depth 628-33 feet, rare; locality 3, abudant.

The examination of a score of more specimens from a locality (No. 3) near that which furnished the types *J.? tumida* shows that the casts of *P. funkhouseri* quite often do not show the spine on the posterior end but the "largest node occupies complete posterior portion of carapace, being so swollen as to be almost uniformly convex." Otherwise the specimens are in such close agreement that I believe they are conspecific. Ulrich's species from the Clore of Kentucky is certainly a *Perprimitia* and very close to *P. funkhouseri.*

Perprimitia robusta Croneis and Gutke

Plate 12, figures 46-48

Perprimitia robusta Croneis and Gutke, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 257, pl. 5, fig. 23, Renault formation.

Perprimitia spinosa Croneis and Gutke, idem., p. 258, pl. 5, fig. 28, Renault formation.

Length, 0.67 mm; height, 0.38 mm; thickness, 0.33 mm.

Renault formation, locality 9, common; Paint Creek formation, locality 2, rare; Golconda formation, locality 17, rare.

The sulcus of the holotype of *P. spinosa* is matrix-filled and the small node anterior to the pit is indistinguishable. For these reasons and because the form ratios are the same I consider these forms so nearly identical as to be conspecific.

Perprimitia sigynae (Coryell and Johnson)

Lokius sigynae Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 216, pl. 26, figs. 6a-c, Clore formation.

Perprimitia tenera Cooper, n. sp.

Plate 12, figures 36-38

Carapace small, subovate; dorsal margin straight, ends rounded, antero-dorsal angles about equal; overlap inconspicuous around free margin; spine prominent, extending well above dorsum in lateral view; node

and lobe along the ventral margin low and somewhat indistinct; sulcus about central, quite deep; greatest height anterior, thickness posterior, length above midheight.

Length, 0.46 mm; height, 0.27 mm; thickness, 0.24 mm.

Golconda formation, locality 19, rare; Glen Dean formation, locality 23, rare.

The lack of posterior obesity marks the figured specimen as a male.

Genus Sansabella Roundy[4]

Sansabella ampla Cooper, n. sp.

Plate 13, figures 32-35

Carapace large, ovate, with subparallel dorsum and venter; ends broadly rounded; forward swing very slight; hinge five-eighths of total shell length straight, channeled, terminated by a notch at each end; sulcus narrow in lower part, widening into cardinal area; overlap very prominent around posterior and ventral free margins; greatest thickness and height of female posterior, greatest thickness of male central; greatest length central; surface smooth.

Length, 1.07 mm; height, 0.67 mm; thickness, 0.53 mm.

Paint Creek formation, locality 2, common.

Sansabella bradfieldi (Coryell and Sohn)

Plate 13, figures 46-51

Persansabella bradfieldi Coryell and Sohn, 1938, Jour. Paleontology, vol. 12, p. 598, pl. 69, figs. 2a, b, Reynolds limestone.

Sansabella whitei Coryell and Sohn (not Bradfield), idem., p. 599, pl. 69, fig. 3, Reynolds limestone.

Jonesina? skinneri (not *J.? dubia*) Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 265, pl. 5, fig. 29, Golconda formation.

Sansabella johnsoni (not *S. laevis*) Croneis and Thurman 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 302, pl. 7, figs. 13, 14, Kinkaid formation.—Croneis and Bristol, 1939, ibid., vol. 34, p. 70, pl. 3, figs. 5-7, Menard formation.

Carapace subrhomboidal, overlap around free margin, especially prominent along venter, dorsum straight; sinus deep, elongate vertically, extending from midheight almost to dorsum; forward swing distinct; hinge deeply channeled, straight; dorsal outline wedge-shaped due to obesity of posterior half; surface smooth.

Length, 0,80 mm; height, 0.51 mm; thickness, 0.41 mm.

Golconda formation, localities 22 (rare) and 19 (common); Glen Dean formation, locality 1, rare; Menard formation, localities 7 (rare) and 28 (common); Kinkaid formation, locality 5, rare.

These upper Chester forms, described under various names, are so similar that they are practically indistinguishable. I have found many reversed specimens in the Illinois samples (see also *S. truncata,* n. sp. pl. 13, figs. 36-41). All other features being equal, the reversal of valves is not considered to be of generic or even of specific character for these Kloedenellidae. The form ratio of the Reynolds forms is 1.55, Kinkaid 1.51, Menard, 1.55 and Golconda 1.55.

Sansabella declivis Cooper, n. sp.

Plate 13, figures 4-8

Carapace subrhomboidal, ends rounded, cardinal angles prominent; dorsum straight, venter curved; overlap pronounced around free margin; sinus deep, narrow, located just in front of center; valves rise rapidly from either end to produce slightly convex outline as seen in dorsal view; anterior end of left valve curves sharply inward forming narrow shelf or platform, widest on antero-ventral margin, tapering to dorsum and venter; hinge typically sansabelloid; surface smooth.

Length, 0.89 mm; height, 0.55 mm; thickness, 0.40 mm.

Golconda formation, locality 19, common.

The form ratio of *S. declivis* is quite high, about 1.6. This species may also be distinguished by the narrow platform on the anterior end of the left valve. This feature is present also on the right valve but is less pronounced.

Sansabella elongata Cooper, n. sp.

Plate 13, figures 1-3

Carapace quite thick, elongate, subrhomboidal, ends rounded; overlap most

[4]See discussion of *Sansabella* under *Jonesina,* p. 55; also under *Lochriella,* p. 57.

prominent on postero-ventral margin; sulcus deep, connected with cardinal area by low saddle; greatest length diagonal from upper posterior to lower anterior end; shallow furrow or flattening of shell convexity borders free margin; hinge deeply incised; surface finely granulose.

Length, 0.75 mm; height, 0.46 mm; thickness, 0.37 mm.

Paint Creek formation, locality 24, depth 2454 feet, abudant.

Sansabella harrisi
Croneis and Funkhouser

Plate 13, figures 15-16

Sansabella harrisi Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 334, pl. 9, figs. 7, 8, Clore formation.

Lamarella thurmani Croneis and Funkhouser, 1938, idem., p. 336, pl. 9, figs. 11, 12, Clore formation.

Length, 0.69 mm; height, 0.44 mm; thickness, 0.33 mm.

Clore formation, locality 26, rare; Kinkaid formation, locality 5, common.

L. thurmani is apparently a mashed specimen of *S. harrisi.*

Sansabella lenticularis Cooper, n. sp.

Plate 13, figures 11-12

Carapace elongate, lens-shaped in dorsal outline; hinge straight, channeled, with notches at ends; greatest thickness central; anterior extremity below and posterior extremity above midheight; prominent sinus just in front of midpoint; postero-ventral truncation marked; overlap prominent around free margin; a short node located in postero-dorsal corner of left valve; surface smooth.

Length, 0.63 mm; height, 0.38 mm; thickness, 0.28 mm.

Clore formation, locality 4, rare.

Sansabella njorthi
(Coryell and Johnson)

Reversabella njorthi Coryell and Johnson, 1939, Jour. Paleontology, vol. 13, p. 221, pl. 26, fig. 8, Clore formation.

Persansabella njorthi. Sohn, 1040, idem., vol. 14, p. 159.

Sansabella ovata Cooper, n. sp.

Plate 13, figures 52-53

Carapace thick, ovate in lateral and dorsal views; ends rounded, dorsum slightly convex; forward swing very slight; overlap prominent; sulcus deep in lower part, becoming abruptly shallower upward toward dorsum; hinge straight and deeply channeled between notches; greatest thickness posterior, although but slightly greater than at anterior end; surface smooth.

Length, 0.66 mm; height, 0.44 mm; thickness, 0.31 mm.

Paint Creek formation, locality 24, depth 2454 feet, common.

This species is distinguished by the regularity of the dorsal and lateral outlines and by the relative thickness of the shell.

Sansabella parallela Cooper, n. sp.

Plate 13, figures 42-43

Carapace somewhat rectangular, venter almost straight, parallel to dorsum; anterior and posterior extremities above and below midheight respectively; hinge straight, very shallowly channeled, terminated at either end by prominent overlapping notch; sinus deep, fairly broad; posterior half tumid; small node in postero-dorsal angle of the right valve; surface smooth; overlap prominent, especially along venter.

Length, 0.72 mm; height, 0.42 mm; thickness, 0.32 mm.

Vienna formation, locality 10, rare.

Sansabella truncata Cooper, n. sp.

Plate 13, figures 36-41

Carapace thick, subovate in lateral view, dorsum straight, ends rounded; venter strongly curved, swinging anteriorly into anterior margin in flat curve, giving a somewhat truncated appearance and a strong anterior swing in lateral view; sulcus elongate, deep, forward of center; overlap very prominent around free margins, especially venter; greatest height central; greatest length diagonal across shell from above center posteriorly to below center anteriorly; hinge straight, distinctly channeled between notches; short spine sometimes located in posterior cardinal angle; surface smooth or finely granulose.

Length, 0.73 mm; height, 0.45 mm; thickness, 0.40 mm.

Golconda formation, locality 22, common.

The lateral outline conforms closely to *Geisina arcuata* (Bean) but since the details of the hingement of Latham's specimen are not certainly known, these thick Golconda specimens have been classified as a new species of *Sansabella.*

SANSABELLA TUMIDA Coryell and Sohn

Plate 13, figures 29-31

Sansabella tumida Coryell and Sohn, 1938, Jour. Paleontology, vol. 12, p. 599, pl. 69, figs. 4a, b, Reynolds limestone.

Length, 1.0 mm; height, 0.66 mm; thickness, 0.50 mm.

Menard formation, locality 20, common.

The Menard specimens are somewhat larger than those from the Reynolds formation, but agree in form ratio, dorsal and lateral outlines, shape and position of the pit, and small size.

SANSABELLA VINITAENSIS (Harlton)

Plate 13, figures 44-45

Jonesina vinitaensis Harlton, 1929, Am. Jour. Sci.. ser. 5, vol. 18, p. 260, pl. 1, figs. 7a, b, Fayetteville shale.

Jonesina holli Croneis and Gutke, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 41, pl. 1, figs. 14, 15, Renault formation.

Jonesina wrighti Croneis and Gutke, idem., p. 41, pl. 1, figs. 22, 23, Renault formation.

Length, 0.67 mm; height, 0.44 mm; thickness, 0.33 mm.

Renault formation, locality 25, rare.

Family LEPERDITELLIDAE Ulrich and Bassler

Genus CYATHUS Roth and Skinner

CYATHUS VETUSTUS Cooper, n. sp.

Plate 13, figures 9-10

Carapace elongate, tumid, ends rounded; dorsum and venter broadly curved; hinge area broad, depressed or trough-like for almost entire length, deepest in posterior quarter; articulation cardine, with projection on left valve; surface reticulations fine, in rows subparallel to margins; no pit observed.

Length, 0.75 mm; height, 0.40 mm; thickness, 0.38 mm.

Paint Creek formation, locality 2, rare.

Genus MICROPARAPARCHITES Croneis and Gale

MICROPARAPARCHITES ERECTUS Cooper, n. sp.

Plate 13, figures 23-25

Carapace small, short, subovate; dorsum straight, venter strongly convex; ends rounded, posterior one slightly more acute, with gentle forward swing; spines broad at base, sharply tapering, directed upward and outward slightly toward side; overlap inconspicuous; surface smooth with slightly punctate area in front of spine just below dorsum.

Length, 0.50 mm; height, 0.33 mm; thickness, 0.30 mm.

Golconda formation, locality 19, rare; Vienna formation, locality 10, common; Menard formation, locality 7, common; Clore formation, locality 4, rare.

M. erectus differs from *M. spinosus* Croneis and Gale and *M. inornatus* Croneis and Bristol in the lack of a "hump" or swollen area just in front of the spine.

Genus PARAPARCHITES Ulrich and Bassler

PARAPARCHITES CYCLOPEUS (Girty)

Plate 13, figures 17-19

Paraparchites nicklesi var. *cyclopea* Girty, 1910, Ann. New York Acad. Sci., vol. 20, p. 232, no figs., Fayetteville shale.

Paraparchites robustus Croneis and Gutke, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 37, pl. 1, fig. 11, Renault formation.

Carapace large, tumid and ovate; dorsal shoulder of left valve prominent; overlap of right valve around entire free margin, greatest along antero-ventral slope; antero-dorsal spine short; retral swing moderate; surface pitted; greatest height about central; greatest length and thickness above middle.

Length, 1.36 mm; height, 1.02 mm; thickness, 0.71 mm.

Renault formation, locality 25, common; Golconda formation, locality 18, rare.

I believe this distinctive form, described by Girty from the Fayetteville shale, merits full specific rank because of the prominent dorsal shoulder on the left valve which Ulrich's species from the Middle Mississippian does not possess.

Paraparchites inornatus (McCoy)

Plate 13, figures 13-14

Cythere inornata McCoy, 1844, Syn. Char. Carb. Fossils, Ireland, p. 167, pl. 23, fig. 18.

Cytherella inornata. Richter, 1855, Deutsch. Geol. Ges. Zeitschr., vol. 7, p. 529, pl. 26, figs. 6, 7.

Leperditia okeni inornata Jones and Kirkby, 1875, Ann. Mag. Nat. Hist., ser. 4, vol. 15, p. 54, pl. 6, fig. 2, Carboniferous of Great Britain.

Leperditia inornata. Jones and Kirkby, 1896, Trans. Roy. Soc. Dublin, vol. 6, p. 183, pl. 11, figs. 15, 16; pl. 12, figs. 1-3.

Paraparchites inornata. Harlton, 1927, Jour. Paleontology, vol. 1, p. 203, pl. 32, figs. 1a, b, Cisco formation.——Delo, 1931, Washington Univ. Studies, n. ser. Sci. and Tec. no. 5, p. 42, pl. 4, fig. 2, Pennsylvanian.

Paraparchites inornatus. Latham, 1933, Trans. Roy. Soc. Edinburgh, vol. 57, pt. 2, no. 12, p. 355, text fig., Carboniferous of Great Britain.——Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 256, pl. 6, fig. 33, Golconda formation.——Croneis and Gutke, 1939, idem., vol. 34, p. 37, pl. 1, fig. 13, Renault formation.

Length, 0.64 mm; height, 0.46 mm; thickness, 0.28 mm.

Renault formation, locality 25, common; Paint Creek formation, locality 2, rare; Golconda formation, locality 18, common; Glen Dean formation, locality 11, rare.

Paraparchites nicklesi (Ulrich)

Plate 14, figures 5-7

Leperditia nicklesi Ulrich, 1891, Jour. Cincinnati Soc. Nat. Hist., vol. 13, p. 200, pl. 18, figs. 1a, e, Chester series.

Paraparchites nicklesi. Grabau and Shimer, 1910, North Am. Index Fossils, p. 343, figs. 1657 c-f. ——Girty, 1911, U. S. Geol. Survey, Bull. 439, p. 105, pl. 9, figs. 2-5, Moorefield shale. ibid., 1915, Bull. 635, p. 134, pl. 11, fig. 2, Batesville sandstone.——Harlton, 1929, Am. Jour. Sci., ser. 5, vol. 18, p. 255, pl. 1, fig. 1, Fayetteville shale.——Croneis, 1930, Arkansas Geol. Survey, Bull. 3, p. 63, pl. 15, fig. 11. ——Morey, 1935, Jour. Paleontology, vol. 9, p. 317, pl. 28, fig. 26, Kinderhook group, ibid., 1935, vol. 9, p. 475, pl. 54, fig. 8, Amsden formation; ibid., 1936, vol. 10, p. 115, pl. 17, fig. 26, Chouteau limestone.——Coryell and Johnson, 1939, idem., vol. 13, p. 214, pl. 25, fig. 1, Clore formation.

Length, 1.43 mm; height, 1.02 mm; thickness, 0.71 mm.

Renault formation, locality 25, rare; Golconda formation, locality 19, common; Clore formation, locality 27, common; Kinkaid formation, locality 5, rare.

Paraparchites ovatus Cooper, n. sp.

Plate 14, figures 1-2

Carapace strongly convex, symmetrical in dorsal view; subovate, in lateral view with distinct retral swing; dorsal margin almost straight; spine indistinct near dorsal margin, but well back from anterior end; overlap very slight, especially on posterior margin; greatest height well back of midlength; greatest thickness slightly forward, above center.

Length, 1.17 mm; height, 0.83 mm; thickness, 0.58 mm.

Clore formation, locality 26, rare.

Genus Proparaparchites Cooper, n. gen.

Carapace ovate, ends symmetrical or nearly so, sides convex, overlap around free margin only; hingement straight and simple; surface smooth, without pits, nodes, or spines.

Genotype — *P. ovatus* n. sp., Kinkaid formation.

This genus differs from other Leperditellidae in the symmetrical lateral and dorsal outlines and in the lack of dorsal overlap.

Proparaparchites fabulus Cooper, n.sp.

Plate 14, figures 3-4

Carapace ovate, bean-shaped, laterally symmetrical, ends rounded; venter convex, dorsum slightly concave; dorsal outline ovate, hinge straight posteriorly, curving slightly toward left valve anteriorly; overlap moderate; surface smooth.

Length, 0.53 mm; height, 0.29 mm; thickness, 0.23 mm.

Renault formation, locality 13, rare.

Differs from *P. ovatus* n. sp. in the greater form ratio, 1.78.

Proparaparchites ovatus Cooper, n. sp.

Plate 14, figures 8-9

Carapace ovate laterally, ends equally rounded; venter slightly convex, dorsum straight; overlap slight, uniform around free margin; dorsal outline elliptical; hinge line straight, slightly but very narrowly channeled in central portion; surface smooth.

Length, 0.50 mm; height, 0.30 mm; thickness, 0.25 mm.

Kinkaid formation, locality 3, abundant.

Family PRIMITIIDAE Ulrich and Bassler

Genus CARBOPRIMITIA
Croneis and Funkhouser

CARBOPRIMITIA CAMPA Cooper, n. sp.

Plate 14, figures 12-15

Carapace subovate; hinge straight, slightly depressed or channeled between notches; overlap equal, complete at each end, much greater along venter; anterior furrow parallel to free margin, merging with depressed overlap area below and with flat, sinus-like area in antero-dorsal quarter; pit wide, deep, antemedian, undefined around margins; cardinal area flat, except on posterior half which barely rises above hinge; greatest length central; greatest height and thickness post-central through shoulder on right valve.

Length, 1.04 mm; height, 0.70 mm; thickness, 0.50 mm.

Menard formation, locality 7, common.

This species may be recognized by the low dorsal protuberance of the right valve, and the deeply channeled, very large overlap along the ventral free margin.

CARBOPRIMITIA LONGULA Cooper, n. sp.

Plate 14, figures 26-29

Carapace large, thick, elongate, surface smooth; pits deep, slightly forward of middle; dorsum flat, sloping toward hinge, shoulder on right valve projecting above hinge; central portion of hinge depressed, channel thus formed terminated by the notch of the sansabelloid articulation; overlap complete around free margin, greatest back of middle of venter; channel, parallel to and just inside anterior margin, marks left valve; greatest height and thickness posterior, through shoulder of right valve; greatest length through middle of shell.

Length, 1.10 mm; height, 0.73 mm; thickness, 0.53 mm.

Clore formation, locality 4, common.

C. longula is similar to previously described species but may be distinguished by the greater length (form ratio, 1.6) and by the greater depth of the pits.

CARBOPRIMITIA ROTUNDA
Croneis and Funkhouser

Plate 14, figures 16-19

Carboprimitia rotunda Croneis and Funkhouser, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 338, pl. 9, figs. 3, 4, Clore formation.

Carboprimitia rotunda var. *tumida* Croneis and Funkhouser, 1938, idem., p. 339, pl. 9, figs. 5, 6, Clore formation.

Length, 1.0 mm; height, 0.71 mm; thickness, 0.50 mm.

Vienna formation, locality 10, rare; Menard formation, locality 7, abundant; Clore formation, locality 4, abundant; Kinkaid formation, locality 5, abundant.

Genus CORYELLINA Bradfield
CORYELLINA ELEGANS
(Croneis and Gutke)

Plate 14, figures 34-36

Perprimitia elegans Croneis and Gutke, 1939, Bull. Denison Univ., Jour. Sci. Lab., vol. 34, p. 38, pl. 1, figs. 3, 4, Renault formation.

Length, 0.60 mm; height, 0.40 mm; thickness, 0.40 mm.

Renault formation, locality 9, rare.

This species closely resembles *C. capax* Bradfield in the general dorsal outline, character of incised articulation on the free margins, obesity, median sulcus, and in the presence of small spines. It differs in the lack of channeling of the hinge line and lacks the development of the posterior end, which is produced to meet the spine. In *C. elegans,* the spine rises from the posterior margin without interruption of the regular curvature of the shell.

Genus TETRASACCULUS Stewart
TETRASACCULUS MIRABLILIS
(Croneis and Gale)

Plate 14, figures 44-53

Pterocodella mirablilis Croneis and Gale, 1938, Bull. Denison Univ., Jour. Sci. Lab., vol. 33, p. 261, pl. 5, figs. 25-27, Golconda formation.

Workmanella distincta Croneis and Gale, idem., p. 277, pl. 5, fig. 11, Golconda formation.

Male: length, 0.70 mm; height, 0.39 mm; thickness, 0.38 mm.

Female: length, 0.87 mm; height, 0.45 mm; thickness, 0.44 mm.

Golconda formation, locality 28, common; Glen Dean formation, locality 23, depth 230-35 feet, common.

Evidence for the association of these peculiar Chester forms with *Tetrasacculus* is furnished by the male specimen here figured. Such features as the centro-ventral and posterior lobes, lateral outline, dorsal and ventral aspect in the male, and the number and position of the brood pouches in the female make this classification rather certain. *Workmanella* of Croneis and Gale seems indistinguishable from the male *Tetrasacculus*.

Family YOUNGIELLIDAE Jones and Kirkby

Genus MOOREA Jones and Kirkby

MOOREA? CIRCINCTA Cooper, n. sp.

Plate 14, figures 37-40

Carapace ovate, subelliptical, ends rounded; dorsum and venter very slightly convex, almost straight; margins bounded by low, narrow ridge parallel to dorsal and ventral margins, subparallel to each end, enclosing broad, gently convex or almost flat area; sides parallel; overlap very slight but continuous around free margins; dorsum channeled by depressed hinge, ending with a notch at either end.

Length, 0.52 mm; height, 0.28 mm; thickness, 0.20 mm.

Paint Creek formation, locality 2, rare.

This species agrees very closely to the generic description of *Moorea,* but is classified with this genus with some hesitation. The encircling ridge of *M.? circincta* is essentially in one plane while that of *M. obesa* Jones and Kirkby and *M. tenuis* Jones and Kirkby show, in the ventral view, a distinct bending toward the line of articulation. No adequate description of the hinge is available for *Moorea;* the hinge of the Paint Creek form is sansabelloid. If this holds for all species, then a reconsideration of family affinities is necessary.

Genus MOORITES Coryell and Billings

MOORITES BREVIS Cooper, n. sp.

Plate 14, figure 43

Carapace short; retral swing slight; dorsal and ventral margins somewhat convex; valves thickened along entire free margin, especially anteriorly and ventrally; surface punctuate.

Length, 0.47 mm; height, 0.27 mm.

Vienna formation, locality 10, common.

The form ratio of 1.9 shows that this species is a shorter form than *M. rhomboidalis* (Croneis and Gutke), which it closely resembles in other respects.

MOORITES CONVEXUS Cooper, n. sp.

Plate 14, figures 32-33

Carapace ovate, ends rounded, anterior cardinal angle being more obtuse; dorsum straight, venter nearly so, parallel to dorsum; thickening of shell apparent only at extremities; surface shallowly pitted; sides distinctly convex; hinge somewhat channeled.

Length, 0.47 mm; height, 0.23 mm; thickness, 0.20 mm.

Paint Creek formation, locality 2, rare.

M. convexus has the same lateral configuration (and form ratio) as *M. rhomboidalis* (Croneis and Gutke), but the latter lacks the convexity of the carapace in dorsal view, and possesses a thickening of the shell around the ventral margin.

MOORITES ELONGATUS Cooper, n. sp.

Plate 14, figures 20-21

Carapace elongate, dorsum and venter straight, parallel; ends rounded, especially posteriorly, with dorsal and ventral angles essentially equal; antero-cardinal angle prominent; surface smooth.

Length, 0.43 mm; height, 0.18 mm; thickness, 0.12 mm.

Renault formation, locality 9, common; Paint Creek formation, locality 2, rare.

This species differs from *M. rhomboidalis* (Croneis and Gutke) and *M. convexus* n. sp. in its relatively greater length (form ratio 2.35).

MOORITES INTERMEDIUS Cooper, n. sp.

Plate 14, figures 41-42

Carapace elongate, with distinct retral swing; sides slightly convex; ventral margin concave; dorsum straight; ends rounded; valves thickened on ends and around ventral angles, this thickness diminishing to almost nothing at middle of ventral margin; surface granulose or finely reticulate.

Length, 0.47 mm; height, 0.20 mm; thickness, 0.13 mm.

Renault formation, locality 9, common.

This species is distinguished by its concave venter and the absence of the thickened margin in the middle of the venter. Its form ratio of 2.25 is intermediate between *M. elongatus* n. sp. and *M. rhomboidalis* (Croneis and Bristol).

Moorites rhomboidalis (Croneis and Bristol)

Plate 14, figures 30-31

Youngiella rhomboidalis Croneis and Bristol, 1939, Jour. Paleontology, vol. 34, p. 100, pl. 3, fig. 23, Menard formation.

Length, 0.50 mm; height, 0.25 mm; thickness, 0.20 mm.

Renault formation, locality 9, rare; Paint Creek formation, locality 18, rare; Golconda formation, locality 19, common; Glen Dean formation, locality 1, rare; Vienna formation, locality 10, common; Menard formation, locality 7, rare; Clore formation, locality 28, depth 689-94 feet, common; Kinkaid formation, locality 5, rare.

This distinctive species, having a form ratio of 2.14, with slightly convex, subparallel sides, and a distinctly elevated rim around the free margins, has been recognized in all marine Chester formations in Illinois, the Reynolds of West Virginia and the Fayetteville of Oklahoma and Arkansas.

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PLATES

AND

EXPLANATIONS

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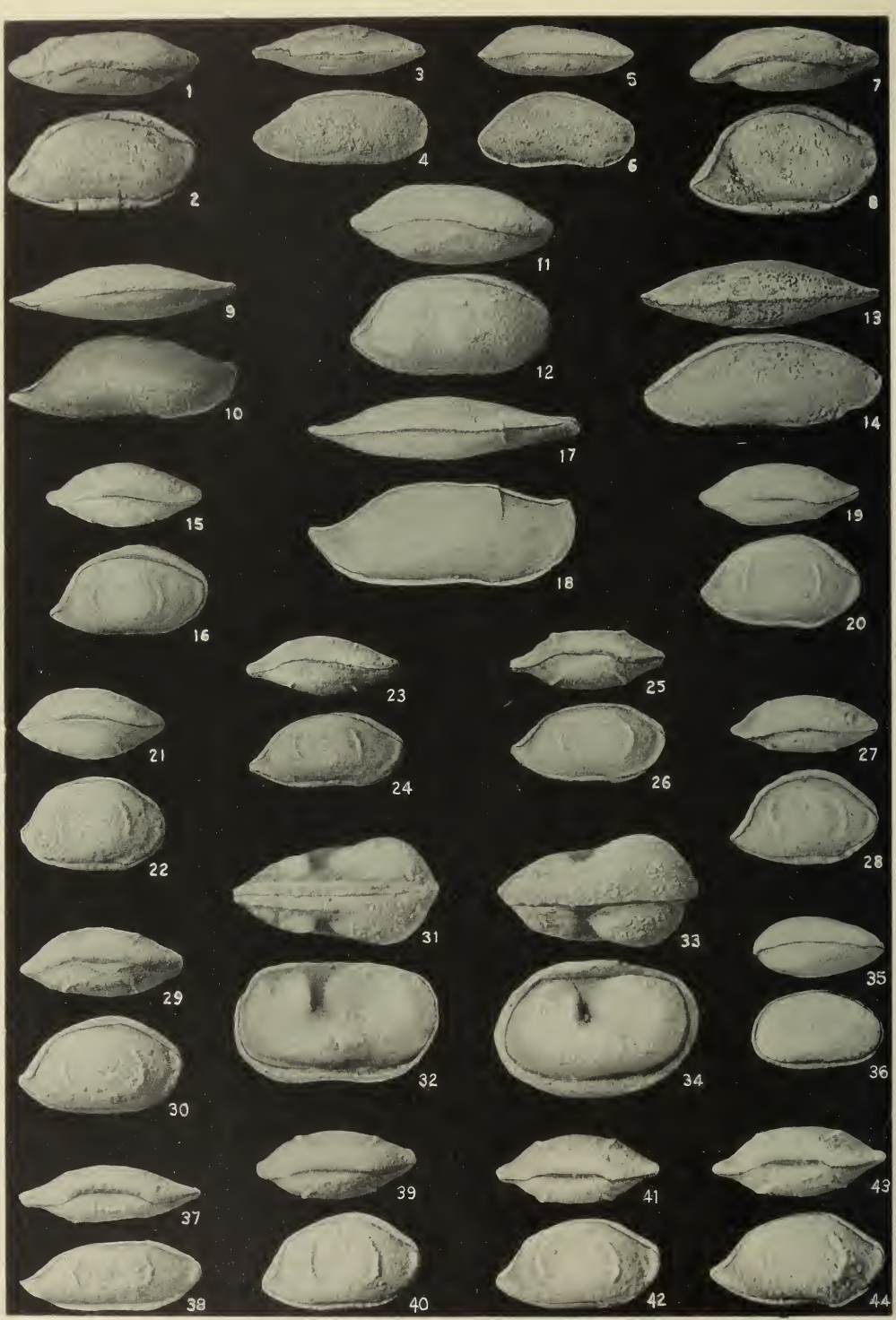
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27–28 *Bairdiolites fornicatus* Cooper, n. sp. Holotype, x30. Menard formation, loc. 15 . p. 27

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33–34 *Beyrichiopsis thori* Coryell and Johnson. Dorsum and left valve, x30. Clore formation, loc. 27

35–36 *Bythocypris amsdenensis* Morey, x40. Fayetteville shale, loc. 31 . . . . . p. 28

37–38 *Bairdiolites tenuis* Cooper, n. sp. Holotype, x30. Renault formation, loc. 13 . . . p. 27

39–40 *Bairdiolites procerus* Cooper, n. sp. Holotype, x30. Kinkaid formation, loc. 6 . . . p. 27

41–42 *Bairdiolites vulgaris* Cooper, n. sp. Holotype, x30. Paint Creek formation, loc. 2 . . p. 28

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7–8 *Bythocypris gibba* Cooper, n. sp. Dorsum and right valve. Holotype, x40. Renault formation, loc. 9 . . . . . p. 28

9–10 *Bythocypris modica* Cooper, n. sp. Dorsum and right valve. Holotype, x40. Paint Creek formation, loc. 24 . . . . . p. 28

11–13 *Bythocypris ovata* Cooper, n. sp. Dorsum, right valve, and venter. Holotype, x30. Paint Creek formation, loc. 21 . . . . . p. 29

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17–19 *Healdia aequabilis* Cooper, n. sp. Posterior end, dorsum, and right valve. Holotype, x40. Renault formation, loc. 25 . . . . . p. 30

20–21 *Bythocypris opima* Cooper, n. sp. Dorsum and right valve. Holotype, x30. Golconda formation, loc. 22 . . . . . p. 29

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34–36 *Cribroconcha fornicata* Cooper, n. sp. Posterior end, dorsum and right valve. Holotype, x40. Paint Creek formation, loc. 24 . . . . . p. 30

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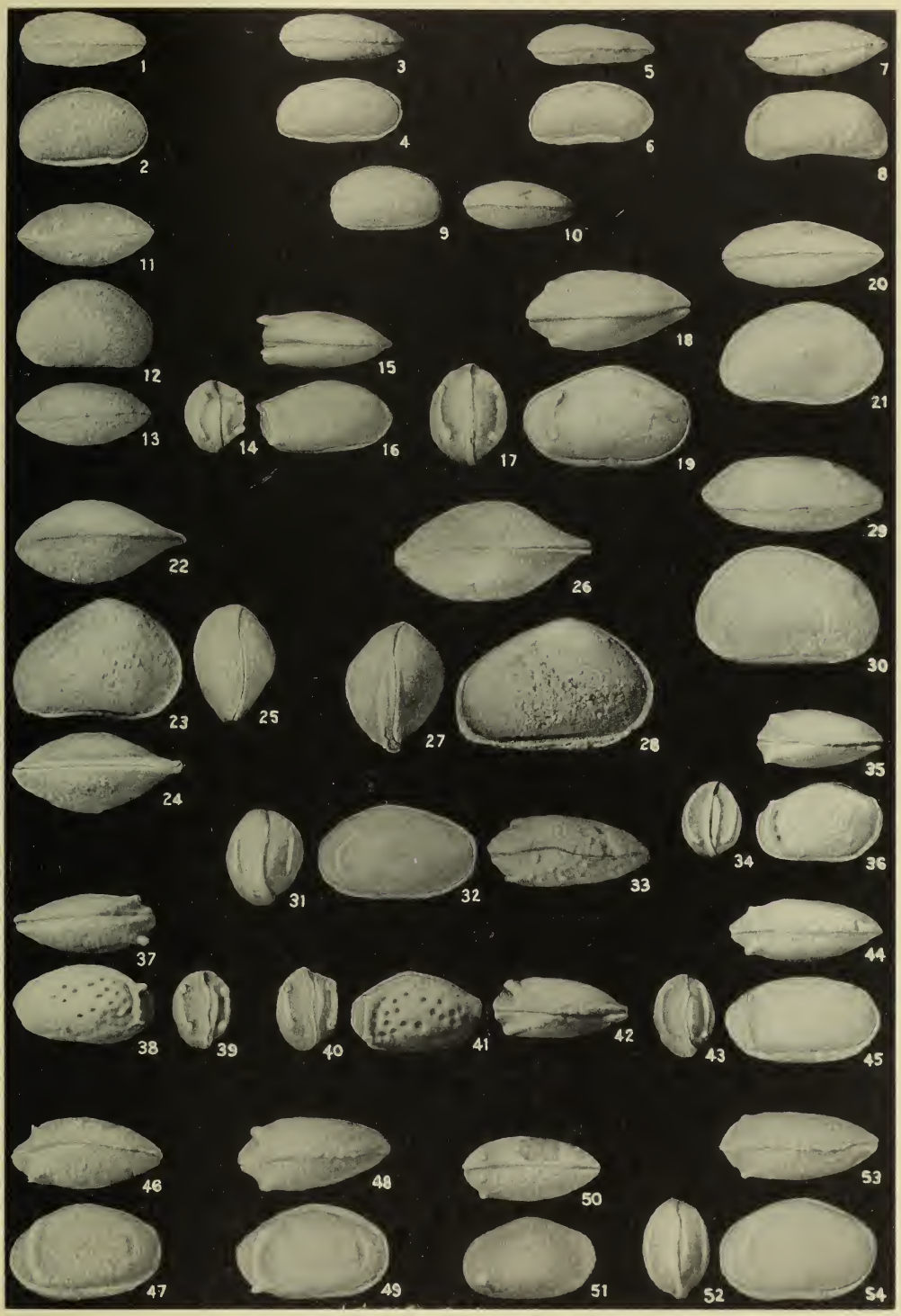
52–54 *Healdia exilis* Cooper, n. sp. Posterior end, dorsum and right valve. Holotype, x40. Vienna formation, loc. 10 . . . . . p. 31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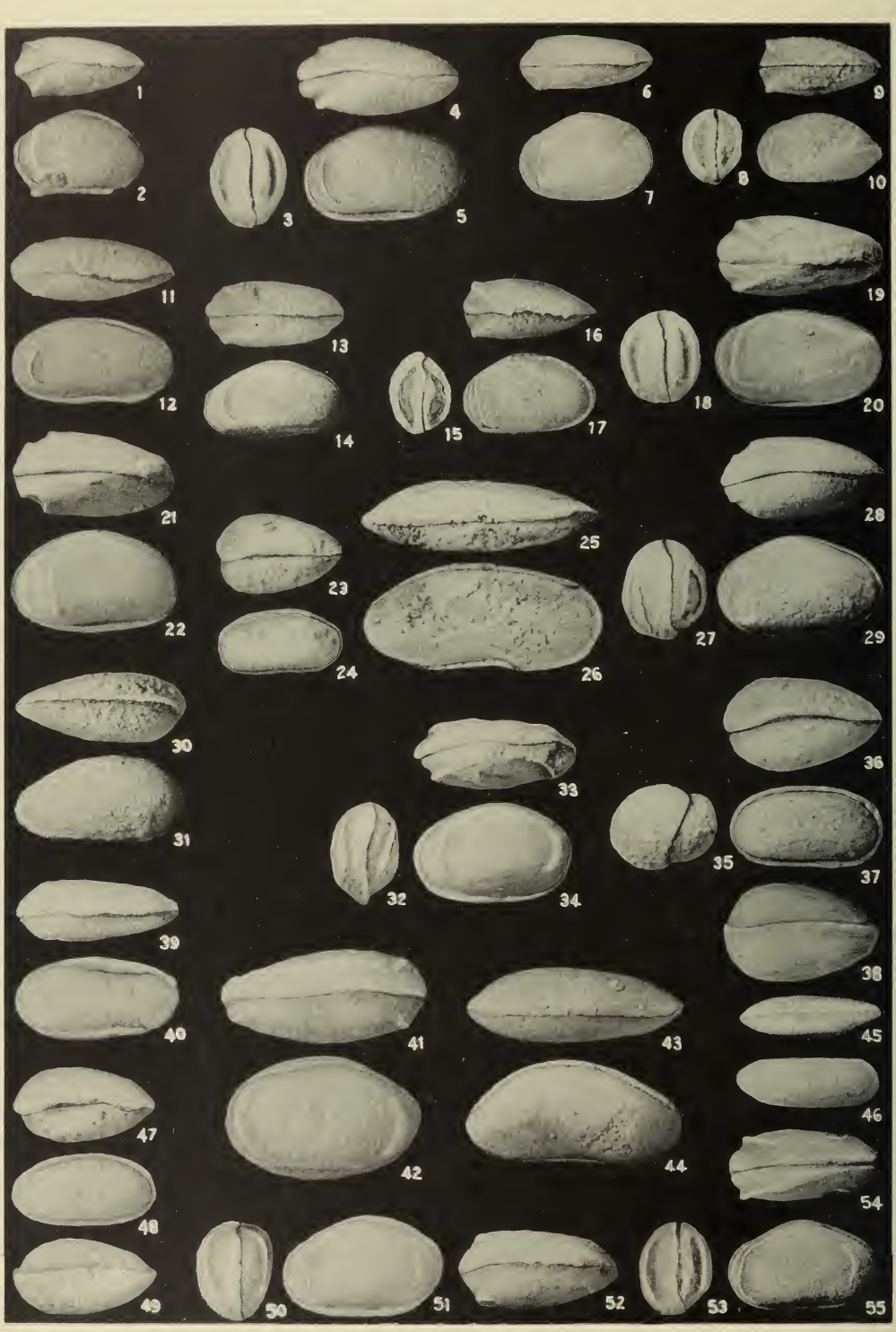
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Explanation of Plate 4

Figs. 1–2 *Healdia ornata* Morey. Dorsum and right valve, x40. Glen Dean formation, loc. 11 p. 32

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6–7 *Healdia minuta* Cooper, n. sp. Dorsum and left valve. Holotype, x40. Paint Creek formation, loc. 24 . . . . . p. 31

8–10 *Healdia mucronata* Cooper, n. sp. Posterior end, dorsum, and right valve. Holotype, x40. Golconda formation, loc. 19 . . . . . p. 31

11–12 *Healdia vinitaensis* Harlton. Dorsum and right valve, x40. Vienna formation, loc. 10 p. 32

13–14 *Healdia tenuicosta* Cooper, n. sp. Dorsum and right valve. Holotype, x40. Clore formation, loc. 4 . . . . . p. 32

15–17 *Healdia ovoidea* Cooper, n. sp. Posterior end, dorsum and right valve. Holotype, x40. Golconda formation, loc. 19 . . . . . p. 32

18–20 *Healdia radinula* Cooper, n. sp. Posterior end, dorsum and right valve. Holotype, x40. Paint Creek formation, loc. 24 . . . . . p. 32

21–22 *Incisurella lata* Cooper, n. sp. Dorsum and right valve. Holotype, x40. Paint Creek formation, loc. 14 . . . . . p. 33

23–24 *Microcheilinella cordata* Cooper, n. sp. Dorsum and right valve. Holotype, x40. Kinkaid formation, loc. 3 . . . . . p. 33

25–26 *Macrocypris ovata* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Kinkaid formation, loc. 3 . . . . . p. 34

27–29 *Incisurella prima* Cooper, n. sp. Posterior end, dorsal view, and right valve. Genotype, x40. Renault formation, loc. 9 . . . . . p. 32

30–31 *Macrocypris acuminata* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Menard formation, loc. 30 . . . . . p. 34

32–34 *Seminolites ovalis* Cooper, n. sp. Posterior end, dorsum and right valve. Holotype, x40. Renault formation, loc. 13 . . . . . p. 33

35–38 *Microcheilinella obesa* Cooper, n. sp. Posterior end, dorsum, right valve and venter. Holotype, x40. Menard formation, loc. 28 . . . . . p. 33

39–40 *Microcheilinella pergracilis* Croneis and Gale. Dorsum and right valve, x40. Vienna formation, loc. 10

41—42 *Seminolites? reversus* Cooper, n. sp. Dorsum and left valve, Holotype, x40. Golconda formation, loc. 17 . . . . . p. 34

43–44 *Macrocypris reginni* Coryell and Johnson. Dorsum and left valve, x30. Kinkaid formation, loc. 3

45–46 *Microcheilinella? exilis* Cooper, n. sp. Dorsum and right valve. Holotype, x40. Renault formation, loc. 9 . . . . . p. 33

47–49 *Microcheilinella tumida* Cooper, n. sp. Dorsum, right valve, and venter. Holotype, x40. Golconda formation, loc. 17 . . . . . p. 33

50–52 *Seminolites sohni* Croneis and Bristol. Posterior end, right valve and dorsum, x40. Golconda formation, loc. 19

53–55 *Seminolites symmetricus* Cooper, n. sp. Posterior end, dorsum and right valve. Holotype, x40. Paint Creek formation, loc. 2 . . . . . p. 34

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8–12 *Tetratylus menardensis* (Croneis and Bristol). 8, 9, left valve and posterior end, Menard formation, loc. 28; 10–12, dorsum, left valve and posterior end, Paint Creek formation, loc. 24, x40 . . . . . p. 35

13–14 *Beyrichia contracta* Cooper, n. sp. Dorsum and right valve. Holotype, x40. Golconda formation, loc. 18 . . . . . p. 35

15–17 *Beyrichia sagitta* Cooper, n. sp. Dorsum, posterior end, and right valve. Holotype, x40. Paint Creek formation, loc. 2 . . . . . p. 35

18–19 *Beyrichia placida* Croneis and Gale. Dorsum and left valve, x40. Golconda formation, loc. 22

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22–23 *Cavellina bransoni* (Morey). Dorsum and right valve, x30. Kinkaid formation, loc. 3 . . . . . p. 35

24–25 *Cavellina coryelli* Croneis and Gale. Dorsum and left valve, x30. Clore formation, loc. 4

26–27 *Cavellina hoeniri* Coryell and Johnson. Dorsum and left valve, x40. Clore formation, loc. 4

28–29 *Cavellina dispar* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Menard formation, loc. 20 . . . . . p. 36

30–31 *Cavellina parallela* Croneis and Gale. Dorsum and left valve, x30. Paint Creek formation, loc. 18

32–33 *Cavellina perplexa* Croneis and Funkhouser. Dorsum and left valve, x30. Clore formation, loc. 4

34–36 *Cavellina exila* Cooper, n. sp. Dorsum, left valve, and posterior end. Holotype, x20. Renault formation, loc. 13 . . . . . p. 36

37–38 *Cavellina librata* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Clore formation, loc. 4 . . . . . p. 36

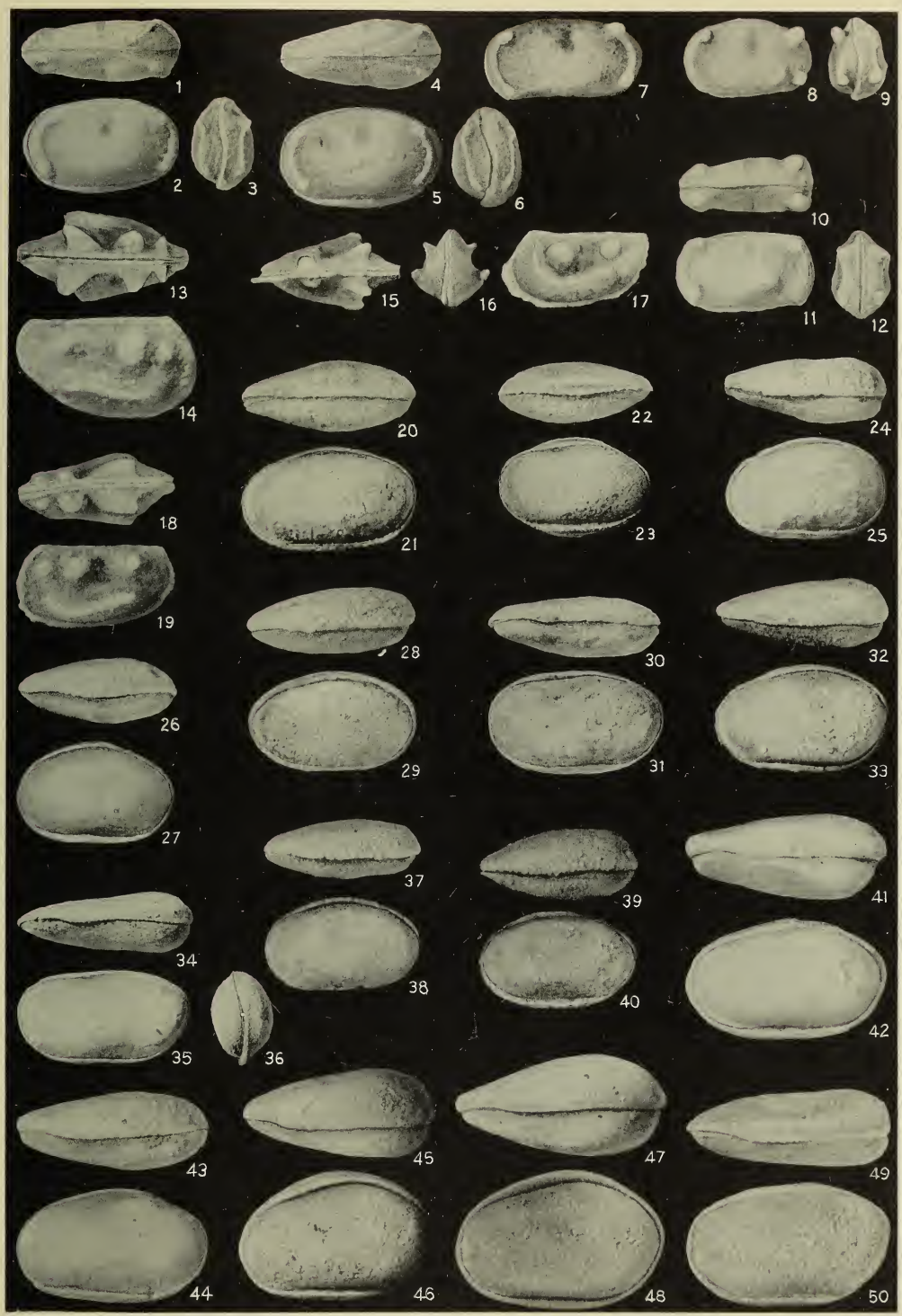
39–40 *Cavellina parva* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Vienna formation, loc. 10 . . . . . p. 37

41–42 *Cavellina longula* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Golconda formation, loc. 22 . . . . . p. 36

43–44 *Cavellina geisi* (Croneis and Gale). Dorsum and left valve, x30. Vienna formation, loc. 10 . . . . . p. 36

45–48 *Cavellina ovatiformis* (Ulrich). Dorsum and left valve. 45, 46, Kinkaid formation, loc. 5; 47, 48, Fayetteville shale, loc. 31, x30 . . . . . p. 37

49–50 *Cavellina glandella* (Whitfield). Dorsum and left valve, x30. Kinkaid formation, loc. 3 . . . . . p. 36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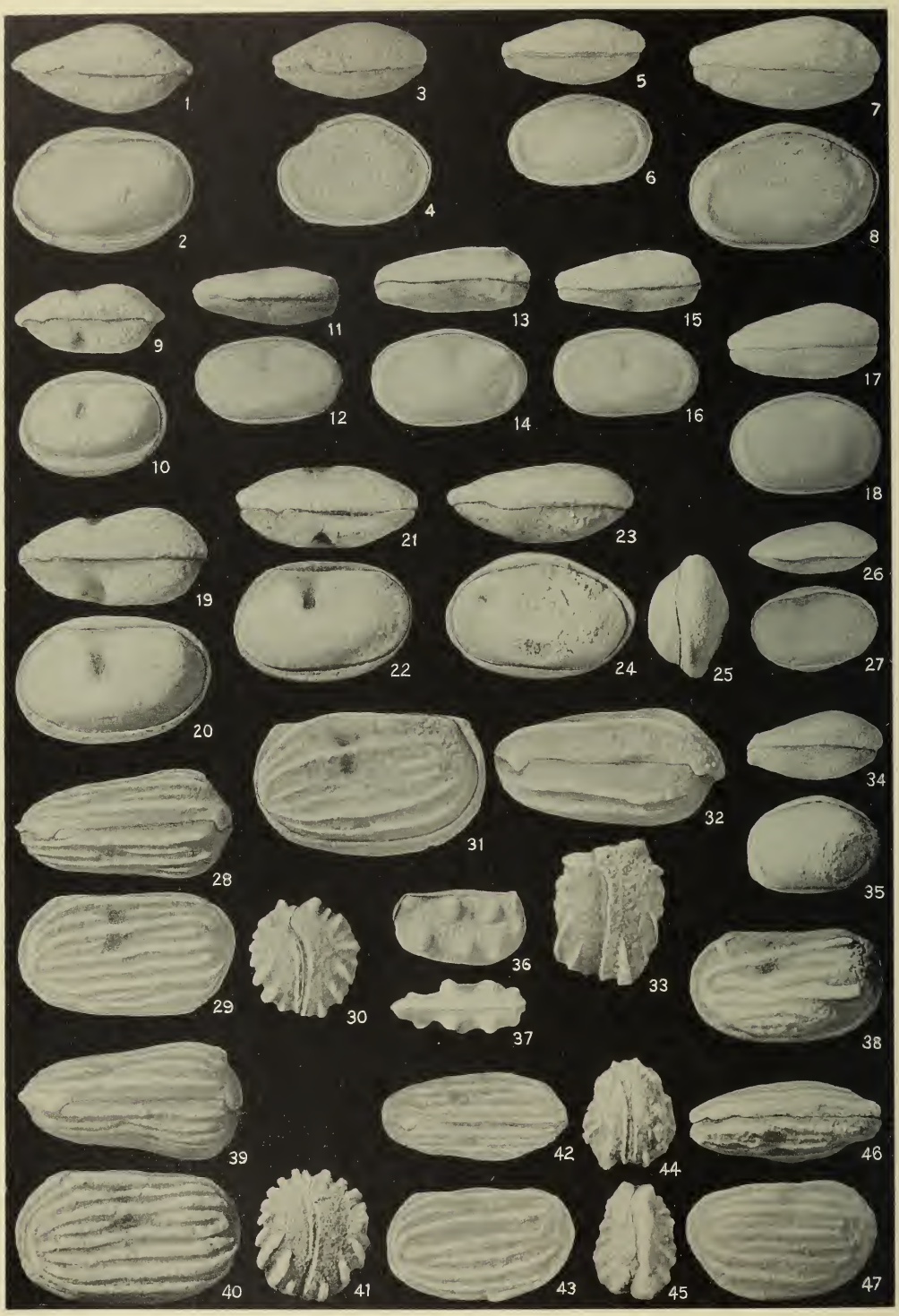
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Explanation of Plate 6

Figs. 1–2 *Sargentina asulcata* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Kinkaid formation, loc. 5 . . . . . p. 39

3–4 *Paracavellina ovata* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Menard formation, loc. 15 . . . . . p. 37

5–6 *Paracavellina elliptica* Cooper, n. sp. Dorsum and left valve. Genotype, x20. Golconda formation, loc. 17 . . . . . p. 37

7–8 *Paracavellina pinguis* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Golconda formation, loc. 17 . . . . . p. 38

9–10 *Sargentina crassimarginata* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Kinkaid formation, loc. 5 . . . . . p. 39

11–12 *Sulcella ovata* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Paint Creek formation, loc. 24 . . . . . p. 39

13–14 *Sulcella nodocosta* Cooper, n. sp. Dorsum and left valve. Holotype, x40. Paint Creek formation, loc. 24 . . . . . p. 39

15–16 *Sulcella celsa* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Paint Creek formation, loc. 24 . . . . . p. 39

17–18 *Paracavellina tumida* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Paint Creek formation, loc. 24 . . . . . p. 38

19–22 *Sargentina allani* Coryell and Johnson. Dorsum and right valve of a female (19, 20) and a male (21, 22) topotypes, x30. Clore formation, loc. 27 . . . . . p. 38

23–25 *Cavellina spatulata* Croneis and Gutke. Dorsum, left valve, and posterior end, x30. Renault formation, loc. 25

26–27 *Platychilus ovoides* Cooper, n. sp. Dorsum and left valve. Genotype, x30. Vienna formation, loc. 10 . . . . . p. 38

28–30 *Glytopleura alternata* Croneis and Funkhouser. Dorsum, left valve, and posterior end, x30. Kinkaid formation, loc. 3

31–33 *Glyptopleura alvea* Cooper, n. sp. Left valve, dorsum and posterior end. Holotype, x30. Kinkaid formation, loc. 5 . . . . . p. 40

34–35 *Paracavellina opima* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Paint Creek formation, loc. 24 . . . . . p. 37

36–37 *Cornigella golcondensis* (Croneis and Gale). Left valve and dorsum, x40. Paint Creek formation, loc. 2 . . . . . p. 39

38 *Glyptopleura bristoli* Croneis and Gutke. Left valve, x30. Renault formation, loc. 25 p. 40

39–41 *Glyptopleura adunca* Croneis and Thurman. Dorsum, left valve, and posterior end, x30. Kinkaid formation, loc. 28

42–44 *Glyptopleura carrolli* Croneis and Bristol. Dorsum, left valve, and posterior end, x30. Menard formation, loc. 20

45–47 *Glyptopleura alata* Croneis and Funkhouser. Anterior end, dorsum and left valve, x30. Clore formation, loc. 26 . . . . . p. 40

Explanation of Plate 7

Figs. 1–3 *Glyptopleura circumcostata* Cooper, n. sp. Dorsum, left valve, and posterior end. Holotype, x30. Kinkaid formation, loc. 3 . . . . . p. 40

4 *Glyptopleura conflexacostata* Croneis and Gale. Right valve, x30. Vienna formation, loc. 10

5–6 *Glyptopleura gibba* Croneis and Gale. Dorsum and right valve, x30. Paint Creek formation, loc. 2

7–8 *Glyptopleura decacostata* Croneis and Gale. Dorsum and right valve, x30. Golconda formation, loc. 23

9–11 *Glyptopleura henbesti* Croneis and Gutke. Dorsum, left valve, and posterior end, x30. Renault formation, loc. 9 . . . . . p. 40

12 *Glyptopleura kellettae* Croneis and Thurman. Right valve, x30. Clore formation, loc. 26 . . . . . p. 41

13-14 *Glyptopleura intermedia* Croneis and Gale. Dorsum and left valve, x30. Golconda formation, loc. 19

15–16 *Gyptopleura* cf. *pentacostata* Croneis and Gale. Dorsum and left valve, x40. Golconda formation, loc. 28

17–19 *Gyptopleura spinosa* (Jones and Kirkby). Dorsum, left valve, and posterior end, x40. Menard formation, loc. 20 . . . . . p. 41

20–22 *Glyptopleura inoptina* Girty. Dorsum, left valve and posterior end of male, x20. Clore formation, loc. 26 . . . . . p. 41

23–24 *Glyptopleura similis* Croneis and Funkhouser. Dorsum and right valve, x30. Clore formation, loc. 26

25–27 *Glyptopleura reniformis* Croneis and Thurman. Dorsum, left valve and posterior end, x30. Kinkaid formation, loc. 5

28–30 *Glyptopleura pseudosulcata* Croneis and Thurman. Dorsum, right valve, and posterior end, x40. Menard formation, loc. 28

31 *Glyptopleura kayi* Croneis and Bristol. Left valve, x20. Menard formation, loc. 20

32 *Glyptopleura complexa* Croneis and Funkhouser. Left valve, x30. Menard formation, loc. 28 . . . . . p. 40

33–34 *Glyptopleura multicostata* Morey. Dorsum and right valve of a mashed specimen, x30. Clore formation, loc. 27 . . . . . p. 41

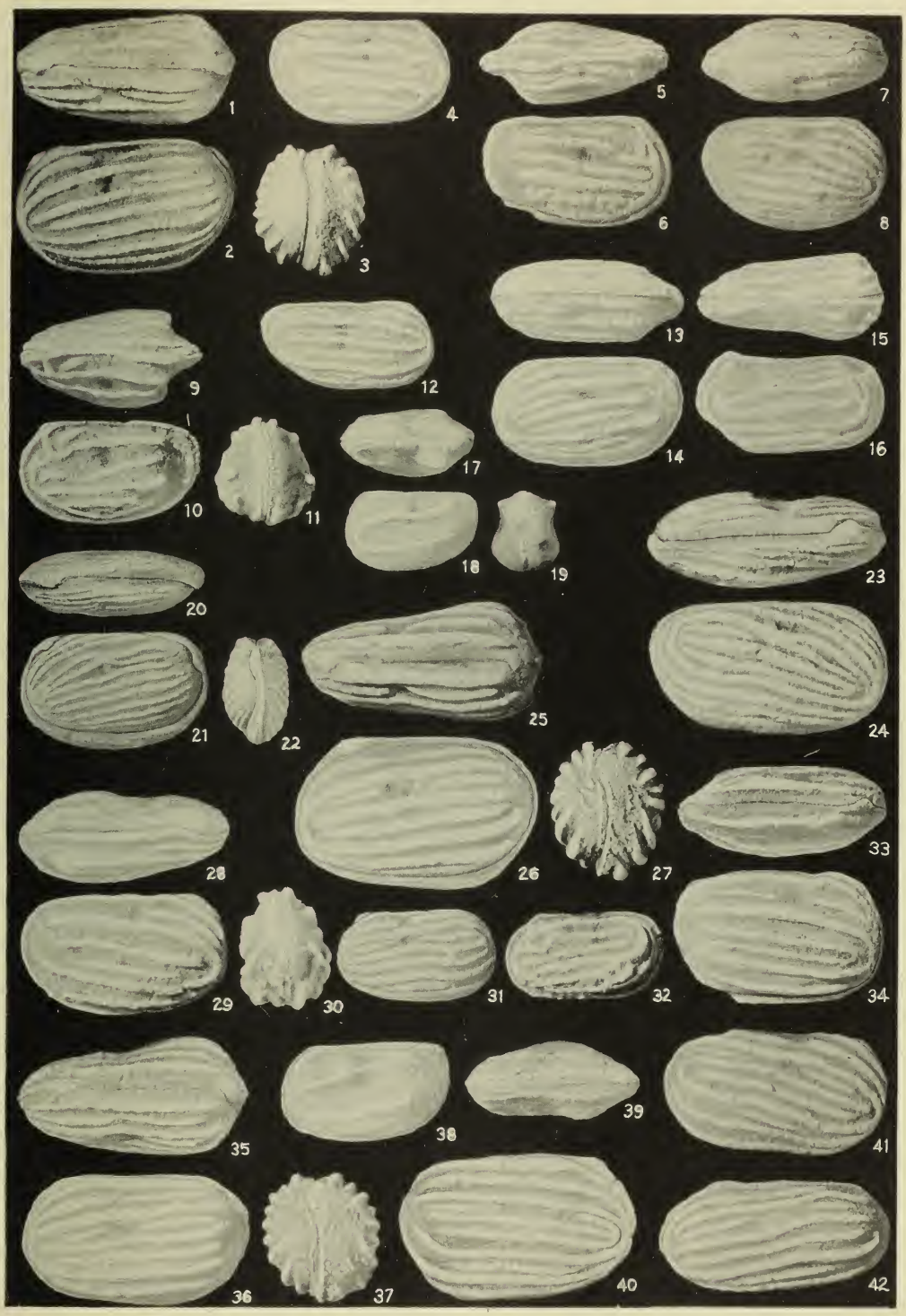
35–37 *Glyptopleura compta* Croneis and Thurman. Dorsum, left valve, and posterior end, x30. Kinkaid formation, loc. 5

38–39 *Glyptopleura sagae* Coryell and Johnson. Left valve and dorsum, x40. Clore formation, loc. 27

40 *Glyptopleura harltoni* Croneis and Bristol. Right valve, x30. Menard formation, loc. 20

41 *Glyptopleura intermedia* Croneis and Gale. Right valve, x30. Menard formation, loc. 32

42 *Glyptopleura elongata* Cooper, n. sp. Left valve. Holotype, x30. Clore formation, loc. 26 . . . . . p. 40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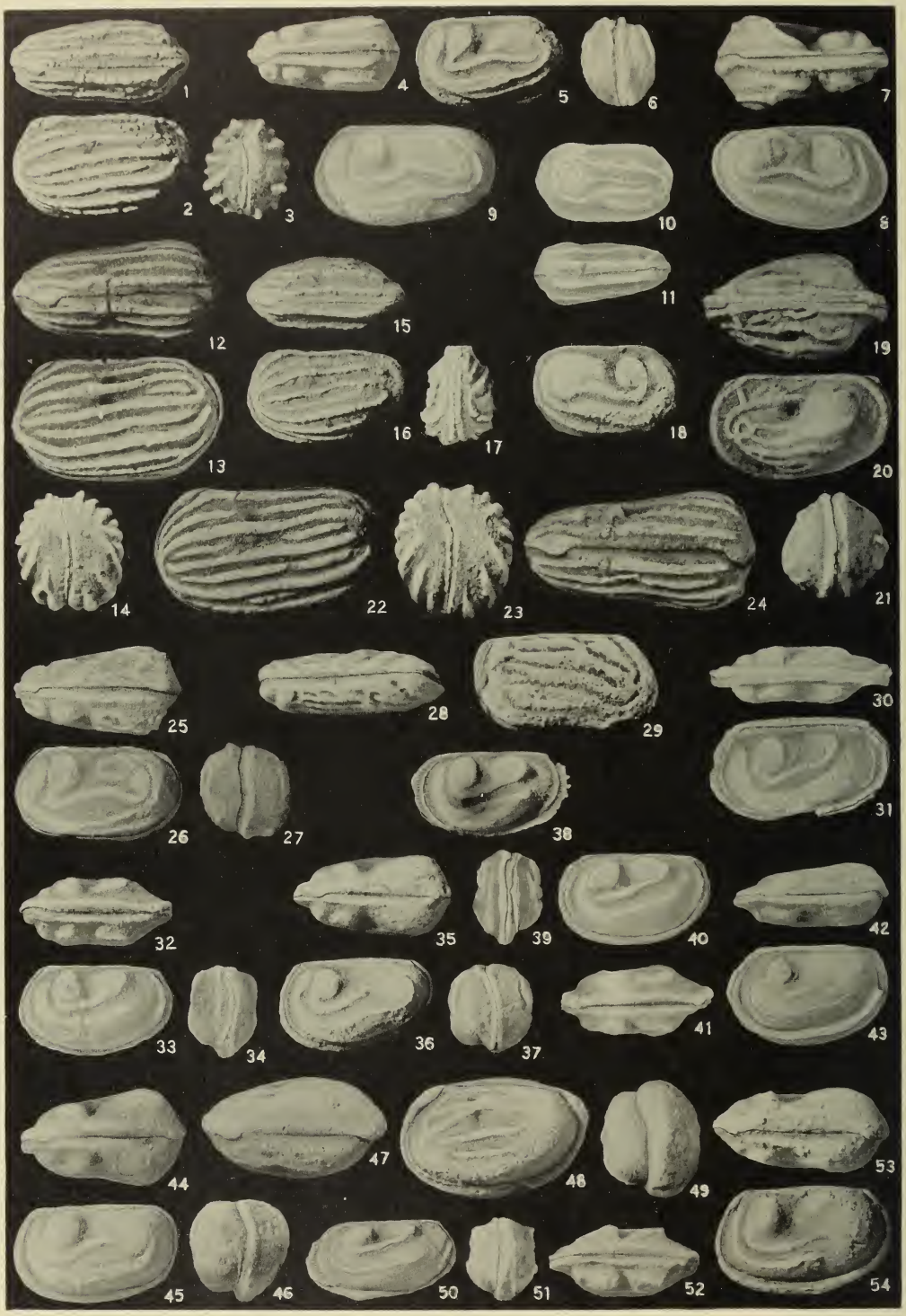
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Explanation of Plate 8

Figs. 1–3 *Glyptopleura teretiformis* Croneis and Thurman. Dorsum, left valve and posterior end, x30. Kinkaid formation, loc. 5

4–6 *Glyptopleurina? bulbosa* Croneis and Gale. Dorsum, left valve and posterior end, x30. Golconda formation, loc. 22

7–8 *Glyptopleurina iniqua* Cooper, n. sp. Dorsum and right valve. Holotype, x30. Vienna formation, loc. 10 . . . . . p. 43

9 *Glyptopleurina oehersi* (Croneis and Bristol). Left valve, x30. Menard formation, loc. 28 . . . . . p. 43

10–11 *Glyptopleura tyri* (Coryell and Johnson). Right valve and dorsum, x30. Clore formation, loc. 27 . . . . . p. 42

12–14 *Glyptopleura symmetrica* Croneis and Thurman. Dorsum, left valve and posterior end, x30. Kinkaid formation, loc. 5 . . . . . p. 41

15–17 *Glyptopleura varians* Croneis and Funkhouser. Dorsum, left valve and anterior end, x30. Kinkaid formation, loc. 3 . . . . . p. 42

18 *Glyptopleurina complexa* Croneis and Bristol. Right valve, x30. Glen Dean formation, loc. 1

19–21 *Glyptopleura venosa* (Ulrich). Dorsum, left valve, and posterior end, x30. Kinkaid formation, loc. 3 . . . . . p. 42

22–24 *Glyptopleura variacostata* Croneis and Thurman. Left valve, posterior end and dorsum, x30. Kinkaid formation, loc. 5

25–27 *Glyptopleurina flexuosa* Cooper, n. sp. Dorsum, left valve, and posterior end. Holotype, x30. Paint Creek formation, loc. 2 . . . . . p. 42

28–29 *Glyptopleuroides insculptus* Croneis and Gale. Dorsum and left valve, x40. Kinkaid formation, loc. 5

30–31 *Glyptopleurina simplex* Croneis and Bristol. Dorsum and left valve of a crushed and flattened specimen, x30. Vienna formation, loc. 10

32–34 *Glyptopleurina coryelli* Croneis and Gutke. Dorsum, left valve, and posterior end, x30. Golconda formation, loc. 19

35–37 *Glyptopleurina ornata* (Croneis and Gale). Dorsum, left valve and posterior end, x30. Golconda formation, loc. 19 . . . . . p. 43

38–41 *Glyptopleurina simulatrix* (Ulrich). 38, left valve, Golconda formation, loc. 28; 39–41, anterior end, left valve and dorsum, Paint Creek formation, loc. 2; x30 p. 43

42–43 *Glyptopleurina simulans* Croneis and Gutke. Dorsum and left valve, x30. Renault formation, loc. 9

44–46 *Glyptopleurina vetula* Cooper, n. sp. Dorsum, left valve and posterior end. Holotype, x30. Golconda formation, loc. 19 . . . . . p. 44

47–49 *Mesoglypha mediocre* Cooper, n. sp. Dorsum, left valve and posterior end. Genotype, x30. Golconda formation, loc. 19 . . . . . p. 44

50–52 *Glyptopleurina longuronis* Cooper, n. sp. Left valve, posterior end and dorsum. Holotype, x30. Renault formation, loc. 9 . . . . . p. 43

53–54 *Glyptopleurina insculpta* (Croneis and Funkhouser). Dorsum and left valve, x30. Kinkaid formation, loc. 5 . . . . . p. 43

Explanation of Plate 9

Figs. 1–3 *Amphissites rugosus Girty*. Dorsum, left valve and posterior end, x30. Kinkaid formation, loc. 3 . . . . . p. 49

4 *Amphissites quadratus* Cooper, n. sp. Left valve. Holotype, x30. Kinkaid formation, loc. 3 . . . . . p. 49

5–6 *Amphissites latinodus* Croneis and Bristol. Left valve and dorsum, x40. Menard formation, loc. 28

7–8 *Graphiadactyllis tenuis* Cooper, n. sp. Dorsum and left valve. Holotype, x20. Fayetteville shale, loc. 33 . . . . . p. 45

9–12 *Graphiadactyllis arkansana* (Girty). 9 interior, showing muscle scar; 10–12 left valve, dorsum, and right valve of genotype, Fayetteville shale, loc. 34; x20. (U. S. G. S. type No. 1893) . . . . . p. 45

13–15 *Amphissites exiguus* Cooper, n. sp. Dorsum, left valve and posterior end. Holotype, x40. Kinkaid formation, loc. 3 . . . . . p. 49

16–17 *Ectodemites magnireticulatus* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Paint Creek formation, loc. 2 . . . . . p. 50

18 *Amphissites golcondensis* Croneis and Gale. Left valve, x40. Paint Creek formation, loc. 2

19–21 *Amphissites carinatus* Cooper, n. sp. Dorsum, left valve and posterior end. Holotype, x30. Glen Dean formation, loc. 11 . . . . . p. 48

22 *Ectodemites costelliferus* (Croneis and Bristol). Left valve, x30. Vienna formation, loc. 10 . . . . . p. 50

23 *Ectodemites oblongus* (Jones and Kirkby). Left valve, x40. Vienna formation, loc. 10 . . . . . p. 50

24–25 *Ectodemites elongatus* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Kinkaid formation, loc. 6 . . . . . p. 50

26–27 *Venula striata* (Croneis and Funkhouser). Dorsum and left valve, x30. Kinkaid formation, loc. 28 . . . . . p. 44

28–29 *Ectodemites obesus* (Croneis and Gale). Dorsum and right valve, x30. Golconda formation, loc. 28 . . . . . p. 50

30–31 *Ectodemites parvus* Cooper, n. sp. Dorsum and left valve. Holotype, x40. Menard formation, loc. 7 . . . . . p. 50

32-34 *Amphissites insignis* Croneis and Thurman. Left valve, posterior end and dorsum. x30. Kinkaid formation, loc. 3

35 *Ectodemites* cf. *monomastadis* (Coryell and Sohn). Left valve, x30. Menard formation, loc. 30 . . . . . p. 50

36–37 *Discoidella ampla* Cooper, n. sp. Dorsum and right valve. Holotype, x40. Renault formation, loc. 9 . . . . . p. 46

38–39 *Discoidella pendens* Croneis and Gutke. Dorsum and right valve, x50. Renault formation, loc. 25

40–41 *Ectodemites planus* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Golconda formation, loc. 8 . . . . . p. 50

42–44 *Hollinella radiata* (Jones and Kirkby). 42, 43 right valves from Glen Dean formation, loc. 1, and Menard formation, loc. 7; 44 spineless left valve from Clore formation, loc. 27; x20 . . . . . p. 46

45 *Hollinella granifera* (Ulrich). Left valve, broken on antero-dorsal corner, x15. Renault formation, loc. 12 . . . . . p. 45

46–47 *Ectodemites primus* Cooper, n. sp. Dorsum and left valve. Genotype, x30. Kinkaid formation, loc. 5 . . . . . p. 51

48–49 *Hollinella longispina* (Jones and Kirkby). Left valves showing broken spines on ventral margin, x20. Renault formation, locs. 12, 14 . . . . . p. 45

50–51 *Ectodemites bicarinatus* (Croneis and Thurman). Dorsum and right valve, x30. Kinkaid formation, loc. 28 . . . . . p. 49

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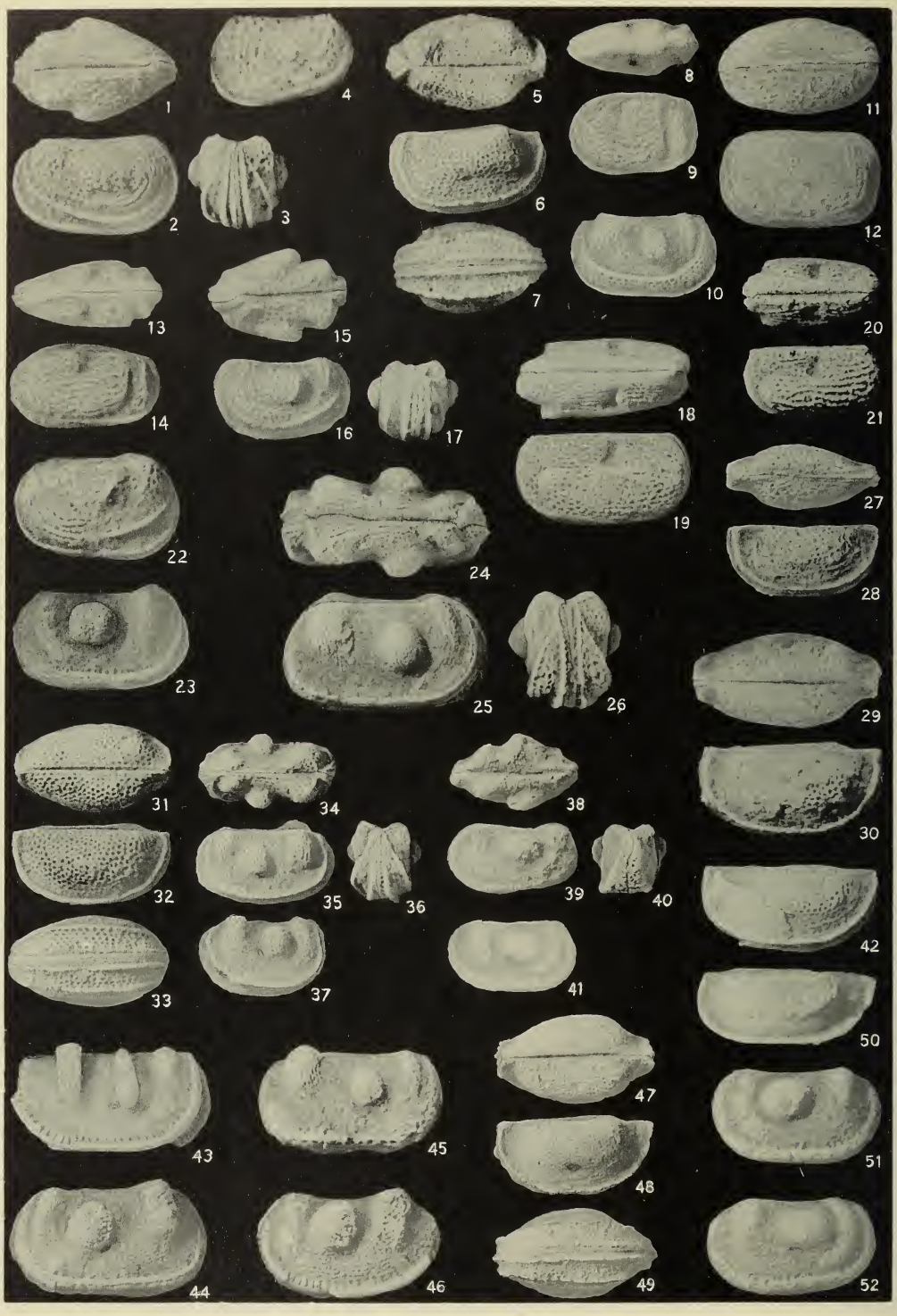
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Explanation of Plate 10

Figs. 1–3 *Ectodemites tumidus* Cooper, n. sp. Dorsum, right valve and posterior end. Holotype, x40. Kinkaid formation, loc. 3 . . . . . p. 51

4 *Polytylites diversus* Cooper, n. sp. Left valve. Holotype, x50. Vienna formation, loc. 10 . . . . . p. 52

5–7 *Kirkbya bifrons* Croneis and Thurman. Dorsum, right valve and venter, x30. Kinkaid formation, loc. 3

8–9 *Kirkbyella truncata* Cooper, n. sp. Dorsum and left valve. Holotype, x40. Menard formation, loc. 30 . . . . . p. 47

10 *Polytylites reticulatus* Cooper, n. sp. Right valve. Holotype, x20. Clore formation, loc. 4 . . . . . p. 53

11–12 *Ectodemites quadratus* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Paint Creek formation, loc. 21 . . . . . p. 51

13–14 *Kirkbyella sulcata* Cooper, n. sp. Dorsum and left valve. Holotype, x50. Paint Creek formation, loc. 2 . . . . . p. 47

15–17 *Polytylites crassus* Cooper, n. sp. Dorsum, left valve and posterior end. Holotype, x50. Kinkaid formation, loc. 3 . . . . . p. 52

18–19 *Kirkbyella quadrata* Coneis and Gutke. Dorsum and right valve, x40. Renault formation, loc. 25

20–21 *Kirkbyella gutkei* Croneis and Bristol. Dorsum and right valve, x40. Menard formation, loc. 7

22 *Ectodemites warei* (Morey). Left valve, x40. Clore formation, loc. 26 . . . . . p. 51

23 *Polytylites biforatus* (Croneis and Thurman). Left valve, x30. Golconda formation, loc. 8 . . . . . p. 52

24-26 *Polytylites bradfieldi* (Croneis and Funkhouser). Dorsum, right valve and posterior end, x30. Clore formation, loc. 4 . . . . . p. 52

27–28 *Kirkbya* cf. *reflexa* Girty. Dorsum and left valve, x20. Golconda formation, loc. 17 p. 47

29–30 *Kirkbya aequalis* Croneis and Funkhouser. Dorsum and right valve, x40. Menard formation, loc. 28

31–33 *Kirkbya symmetrica* Croneis and Thurman. Dorsum, left valve and venter, x30. Kinkaid formation, loc. 3

34–37 *Polytylites geniculatus* Cooper, n. sp. 34–36 dorsum, left valve and posterior end of genotype, Vienna formation, loc. 10; 37 right valve, Renault formation, loc. 9; x30 . . . . . p. 52

38–41 *Polytylites nodobliquus* (Croneis and Gale). 38–40 dorsum, right valve and posterior end, Renault formation, loc. 12; 41 right valve, Golconda formation, loc. 8; x20 . . . . . p. 53

42 *Kirkbya fossula* Croneis and Bristol. Left valve, x40. Menard formation, loc. 7

43 *Polytylites directus* Cooper, n. sp. Right(?) valve. Holotype, x40. Glen Dean formation, loc. 1 . . . . . p. 52

44 *Polytylites elongatus* (Croneis and Bristol). Left valve, x30. Kinkaid formation, loc. 5 . . . . . p. 52

45 *Polytylites quincollinus* (Harlton). Right valve, x30. Renault formation, loc. 9 . . p. 53

46 *Polytylites ambitus* Cooper, n. sp. Left valve, Holotype, x30. Renault formation, loc. 12 . . . . . p. 51

47–49 *Kirkbya humerosa* Cooper, n. sp. Dorsum, left valve and venter. Holotype, x20. Kinkaid formation, loc. 3 . . . . . p. 46

50 *Kirkbya elongata* Cooper, n. sp. Right valve. Holotype, x30. Paint Creek formation, loc. 2 . . . . . p. 46

51–52 *Polytylites fossilis* (Croneis and Thurman). 51 left valve, Golconda formation, loc. 8; 52 right valve, Paint Creek formation, loc. 2; x30 . . . . . p. 52

Explanation of Plate 11

Figs. 1–4 *Polytylites tricollinus* (Jones and Kirkby). Dorsum, left valve, venter and posterior end, x30. Glen Dean formation, loc. 1 . . . . . p. 54

5 *Polytylites trilobus* (Croneis and Gale). Left valve, x30. Golconda formation, loc. 16 p. 54

6, 17 *Polytylites superus* (Croneis and Gale). 6 left valve, Menard formation, loc. 7; 17 right valve, Golconda formation, loc. 16; x30 . . . . . p. 53

7–9 *Savagella? acuminata* Cooper, n. sp. Posterior end, dorsum, and right valve. Holotype, x30. Renault formation, loc. 12 . . . . . p. 47

10–12 *Chesterella exuta* Croneis and Gutke. Dorsum, left valve and posterior end, x30. Renault formation, loc. 25

13–14 *Deloia tumida* Cooper, n. sp. Dorsum and left valve, somewhat crushed. Holotype, x30. Kinkaid formation, loc. 3 . . . . . p. 54

15–16 *Jonesina equilatera* Cooper, n. sp. Dorsum and left valve. Holotype, x20. Paint Creek formation, loc. 2 . . . . . p. 56

18 *Deloia spinosa* Croneis and Bristol. Left valve, x30. Vienna formation, loc. 10 . . p. 54

19–21 *Chesterella fissurata* Croneis and Gutke. Dorsum, left valve and posterior end, x30. Renault formation, loc. 9

22–23 *Polytylites wilsoni* (Croneis and Gutke). Dorsum and left valve, x30. Renault formation, loc. 9 . . . . . p. 54

24 *Polytylites sublineatus* (Croneis and Thurman). Left valve, x20. Kinkaid formation, loc. 5 . . . . . p. 53

25–27 *Geffenina marmerae* Coryell and Sohn. Anterior end, dorsum and left valve, x30. Reynolds formation, loc. 35

28–30 *Chesterella incerta* Cooper, n. sp. Dorsum, left valve and posterior end. Holotype, x40. Renault formation, loc. 25 . . . . . p. 54

31–33 *Geffenina johnsoni* Coryell and Sohn. Dorsum, left valve and posterior end, x30. Reynolds formation, loc. 35

34 *Denisonia cirrata* Cooper, n. sp. Right valve. Holotype, x30. Golconda formation, loc. 18 . . . . . p. 55

35 *Deloia serrata* Croneis and Thurman. Left valve, x30. Kinkaid formation, loc. 3

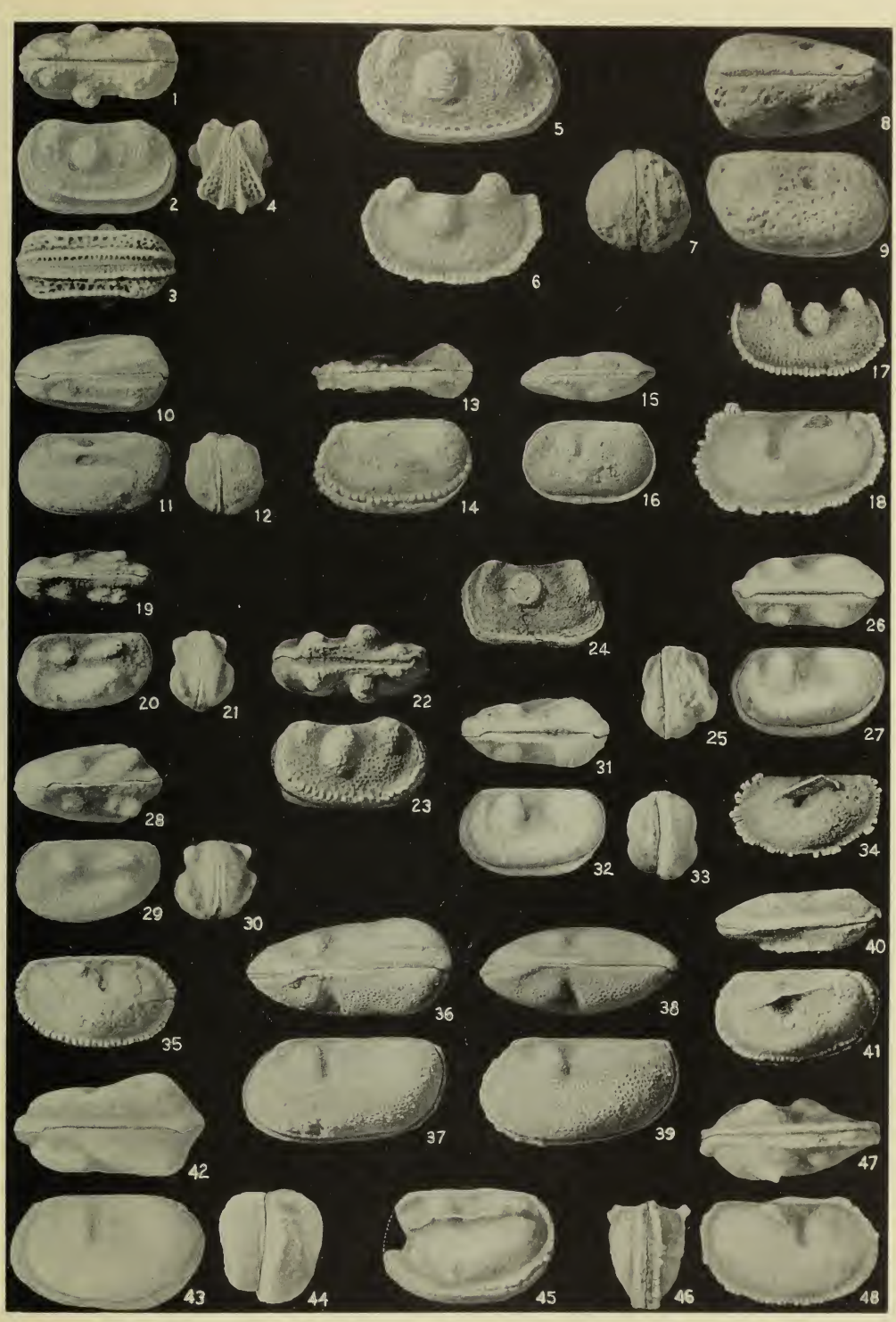
36–39 *Jonesina craterigera* (Brady). 36–37 Dorsum and left valve of female, x30; Golconda formation, loc. 19; 38–39 dorsum and left valve of male, x40, Glen Dean formation, loc. 1. Note difference in magnification . . . . . p. 56

40–41 *Denisonia brevicosta* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Golconda formation, loc. 22 . . . . . p. 54

42–44 *Geffenina? praelonga* Cooper, n. sp. Dorsum, left valve and posterior end. Holotype, x30. Golconda formation, loc. 19 . . . . . p. 55

45 *Denisonia cincta* Croneis and Bristol. Left valve, broken and somewhat crushed, x30. Clore formation, loc. 4

46–48 *Deloia sulcata* Croneis and Funkhouser. Posterior end, dorsum and right valve, x30. Golconda formation, loc. 17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Explanation of Plate 12

Figs. 1–2 *Jonesina persulcata* Croneis and Gale. Dorsum and left valve, x30. Golconda formation, loc. 18

3–5 *Oliganisus geisi* Croneis and Gutke. 3 left valve, Paint Creek formation, loc. 2, x40; 4–5 dorsum and left valve, Renault formation, loc. 12, x30

6–7 *Jonesina tenuisinuosa* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Golconda formation, loc. 19 . . . . . p. 57

8–9 *Jonesina intermedia* Croneis and Bristol. Dorsum and left valve, x30. Vienna formation, loc. 36 . . . . . p. 56

10–11 *Kloedenella macer* Cooper, n. sp. Dorsum and right valve. Holotype, x40. Glen Dean formation, loc. 1 . . . . . p. 57

12–15 *Neokloedenella subquadrata* Croneis and Gutke. Dorsum, left valve, venter and posterior end, x30. Renault formation, loc. 9

16–17 *Jonesina spinigera* Cooper, n. sp. Dorsum and left valve, x30. Paint Creek formation, loc. 24 . . . . . p. 57

18–19 *Lochriella reversa* (Morey). Dorsum and left valve, x30. Clore formation, loc. 27 p. 57

20–21 *Jonesina puncta* Morey. Dorsum and left valve, x30. Clore formation, loc. 4 . . . p. 56

22–24 *Neokloedenella secunda* Croneis and Bristol. Dorsum, left valve, end, x30. Menard formation, loc. 7

25–27 *Perprimitia turrita* Croneis and Gutke. Right valve, anterior end and dorsum, x40. Golconda formation, loc. 22

28–29 *Lochriella fenriri* (Coryell and Johnson). Dorsum and left valve, x20. Clore formation, loc. 27 . . . . . p. 57

30–32 *Perprimitia elongata* Cooper, n. sp. Right valve, anterior end and dorsum. Holotype, x40. Paint Creek formation, loc. 2 . . . . . p. 58

33–35 *Neokloedenella prima* Croneis and Funkhouser. Dorsum, left valve and posterior end, x30. Clore formation, loc. 26

36–38 *Perprimitia tenera* Cooper, n. sp. Right valve, anterior end and dorsum. Holotype, x40. Golconda formation, loc. 19 . . . . . p. 58

39–41 *Perprimitia? bicornis* Croneis and Gale. Posterior end, dorsum and right valve, x30. Golconda formation, loc. 28

42–43 *Neokloedenella? magna* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Golconda formation, loc. 19 . . . . . p. 57

44–45 *Perprimitia funkhouseri* Croneis and Thurman. Dorsum and left valve, x40. Kinkaid formation, loc. 28 . . . . . p. 58

46–48 *Perprimitia robusta* Croneis and Gale. Dorsum, left valve and venter, x40. Paint Creek formation, loc. 2 . . . . . p. 58

49–51 *Perprimitia matheri* Croneis and Bristol. Dorsum, left and right valves, x40. Vienna formation, loc. 10

Explanation of Plate 13

Figs. 1–3 *Sansabella elongata* Cooper, n. sp. Dorsum, left and right valves. Holotype, x30. Paint Creek formation, loc. 24 . . . . . p. 59

4–8 *Sansabella declivis* Cooper, n. sp. 4–6 dorsum, left valve and posterior end of holotype; 7–8 dorsum and left valve of another specimen; x30. Golconda formation, loc. 19 . . . . . p. 59

9–10 *Cyathus vetustus* Cooper, n. sp. Dorsum and left valve. Holotype, x30. Paint Creek formation, loc. 2 . . . . . p. 61

11–12 *Sansabella lenticularis* Cooper, n. sp. Left valve and dorsum. Holotype, x30. Clore formation, loc. 4 . . . . . p. 60

13–14 *Paraparchites inornatus* (McCoy). Dorsum and left valve, x30. Renault formation, loc. 25 . . . . . p. 62

15–16 *Sansabella harrisi* Croneis and Funkhouser. Dorsum and right valve, x30. Clore formation, loc. 26 . . . . . p. 60

17–19 *Paraparchites cyclopeus* Girty. Left valve, dorsum and right valve, x15. Golconda formation, loc. 18 . . . . . p. 61

20–21 *Paraparchites kinkaidensis* Croneis and Thurman. Dorsum and left valve, x20. Kinkaid formation, loc. 5

22 *Microparaparchites inornatus* Croneis and Bristol. Left valve, x40. Clore formation, loc. 4

23–25 *Microparaparchites erectus* Cooper, n. sp. Dorsum, left valve and posterior end. Holotype, x40. Golconda formation, loc. 19 . . . . . p. 61

26–28 *Microparaparchites spinosus* Croneis and Gale. Posterior end, dorsum and right valve. Holotype, x30. Glen Dean formation, loc. 23

29–31 *Sansabella tumida* Coryell and Sohn. Posterior end, dorsum and left valve, x20. Menard formation, loc. 20 . . . . . p. 61

32–35 *Sansabella ampla* Cooper, n. sp. Dorsum, left valve, venter and posterior end. Holotype, x20. Paint Creek formation, loc. 2 . . . . . p. 59

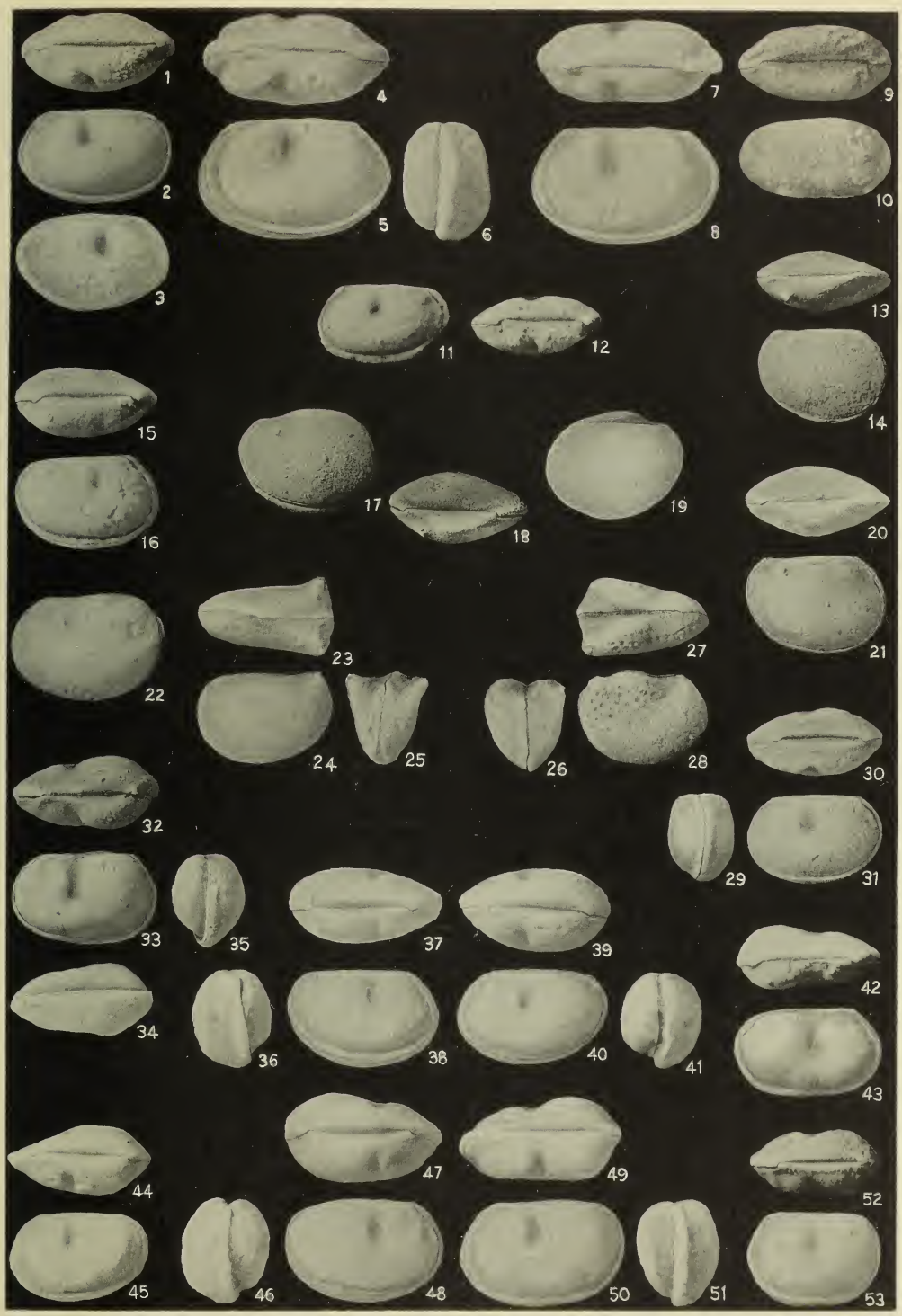
36–41 *Sansabella truncata* Cooper, n. sp. 36–38 posterior end, dorsum and right valve of a reversed specimen; 39–41 dorsum, left valve and posterior end of a normal specimen, holotype; x30. Golconda formation, loc. 22. (Note reversal of another species, figs. 46-51) . . . . . p. 60

42–43 *Sansabella parallela* Cooper, n. sp. Dorsum and right valve. Holotype, x30. Vienna formation, loc. 10 . . . . . p. 60

44–45 *Sansabella vinitaensis* (Harlton). Dorsum and left valve, x30. Renault formation, loc. 25 . . . . . p. 61

46–51 *Sansabella bradfieldi* (Coryell and Sohn). 46–48 posterior end, dorsum and right valve of a reversed specimen; 49–51 dorsum, left valve and posterior end of a normal specimen; x30. Golconda formation, locs. 22, 19 . . . . . p. 59

52–53 *Sansabella ovata* Cooper, n. s. Dorsum and left valve. Holotype, x30. Paint Creek formation, loc. 24 . . . . . p. 60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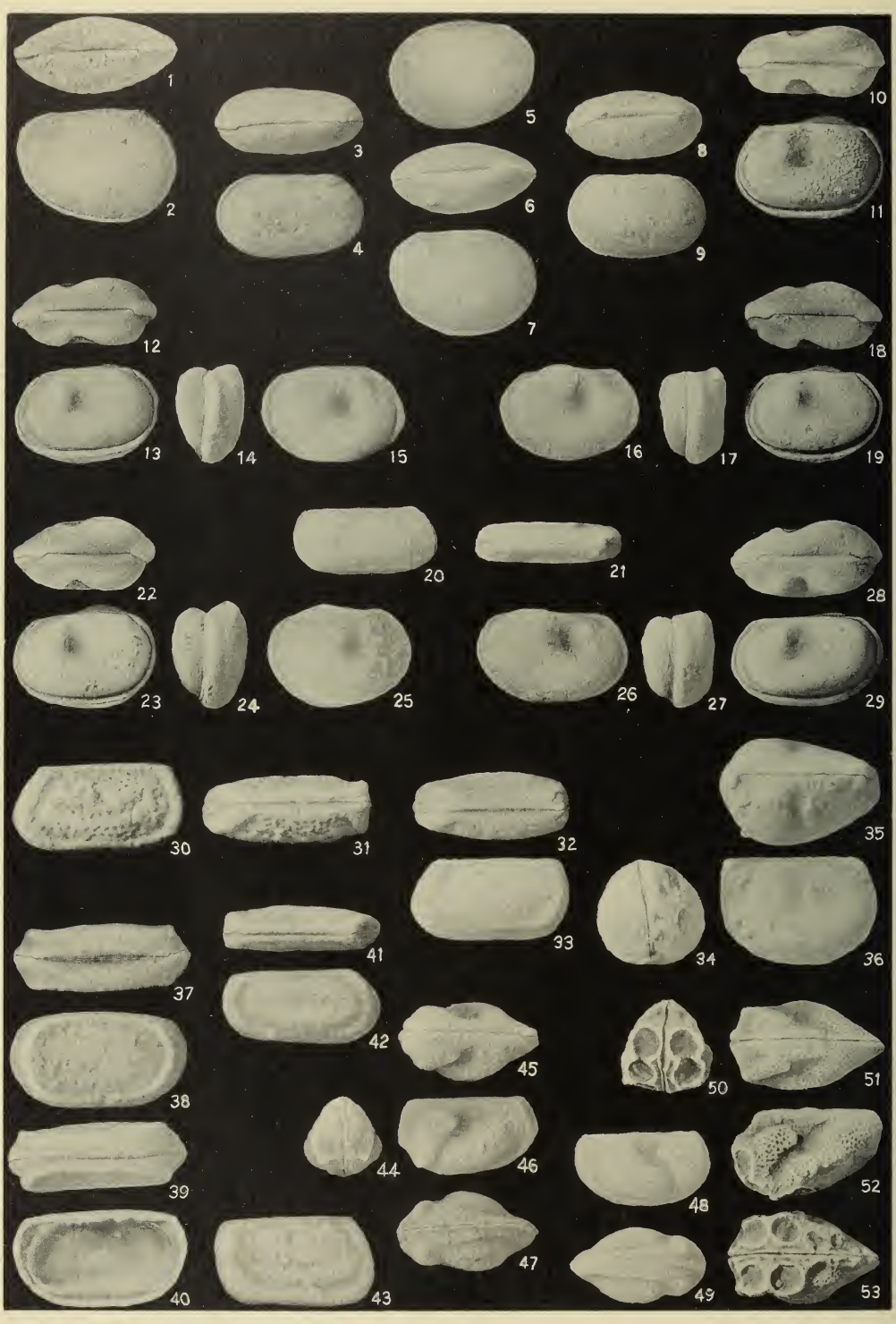
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Figs. 1–2 *Paraparchites ovatus* Cooper, n. sp. Dorsum and left valve. Holotype, x20. Clore formation, loc. 26 . . . . . p. 62

3–4 *Proparaparchites fabulus* Cooper, n. sp. Dorsum and left valve. Holotype, x40. Renault formation, loc. 13 . . . . . p. 62

5–7 *Paraparchites nicklesi* (Ulrich). Right valve, dorsum and left valve, x15. Golconda formation, loc. 19 . . . . . p. 62

8–9 *Proparaparchites ovatus* Cooper, n. sp. Dorsum and left valve. Genotype, x40. Kinkaid formation, loc. 3 . . . . . p. 62

10–11 *Carboprimitia simulans* Croneis and Bristol. Dorsum and left valve, x20. Kinkaid formation, loc. 5

12–15 *Carboprimitia campa* Cooper, n. sp. Dorsum, left valve, posterior end and right valve. Holotype. x20. Menard formation, loc. 7 . . . . . p. 63

16–19 *Carboprimitia rotunda* Croneis and Funkhouser. Right valve, posterior end, dorsum and left valve, x20. Clore formation, loc. 4 . . . . . p. 63

20–21 *Moorites elongatus* Cooper, n. sp. Left valve and dorsum. Holotype, x50. Paint Creek formation, loc. 2 . . . . . p. 64

22–25 *Carboprimitia depressa* Croneis and Funkhouser. Dorsum, left valve, posterior end and right valve, x20. Clore formation, loc. 26

26–29 *Carboprimitia longula* Cooper, n. sp. Right valve, posterior end, dorsum and left valve. Holotype, x20. Clore formation, loc. 4 . . . . . p. 63

30–31 *Moorites rhomboidalis* (Croneis and Bristol). Right valve and dorsum, x50. Clore formation, loc. 28 . . . . . p. 65

32–33 *Moorites convexus* Cooper, n. sp. Dorsum and right valve. Holotype, x50. Paint Creek formation, loc. 2 . . . . . p. 64

34–36 *Coryellina elegans* (Croneis and Gutke). Posterior end, dorsum and right valve, x40. Renault formation, loc. 9 . . . . . p. 63

37–40 *Moorea? circincta* Cooper, n. sp. 37–39 dorsum, left valve and venter of holotype; 40 interior of another specimen from the same locality; x50. Paint Creek formation, loc. 2 . . . . . p. 64

41–42 *Moorites intermedius* Cooper, n. sp. Dorsum and left valve. Holotype, x50. Renault formation, loc. 9 . . . . . p. 64

43 *Moorites brevis* Cooper, n. sp. Left valve. Holotype, x50. Vienna formation, loc. 10 p. 64

44–53 *Tetrasacculus mirablilis* (Croneis and Gale). x30. 44–47 posterior end, dorsum, right valve and venter, and 48–49 left valve and venter, both males from Glen Dean formation, loc. 23; 50–53 posterior end, dorsum, right valve and venter of a female, Golconda formation, loc. 28. Note similarities of male and female dorsal views but difference in size and modification of ventral and posterior lobes by the brood pouches . . . . . p. 63

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